

**Edouard R. Quatrevaux**

October 28, 2019

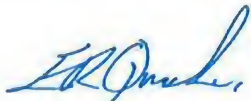
BuzzFeed News  
Washington, D.C.

To whom it may concern:

I am responding to BuzzFeed's requests for a report completed during my tenure as New Orleans Inspector General. The report was requested for a story BuzzFeed has been working on about water quality testing.

The attached report on New Orleans Sewerage and Water Board water quality testing was completed and approved for public release by me on October 19, 2017. I left the New Orleans Office of Inspector General after that, with the belief that the report would be released. It was not released. I believe that the information contained in this report would be of value to the citizens of New Orleans.

Sincerely,



Edouard R. Quatrevaux  
Former Inspector General  
City of New Orleans



**ED QUATREVAUX**  
**INSPECTOR GENERAL**

**October 19, 2017**

**Re: S&WB Lead and Copper Rule Water Quality Testing**

**I certify that the inspector general personnel assigned to this project are free of personal or other external impairments to independence.**

**E.R. Quatrevaux**

**Inspector General**

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**The public health threat caused by elevated levels of lead in drinking water in Washington, D.C. and Flint, Michigan brought the issue of drinking water quality to national attention. The problems with water quality experienced by these cities highlight the importance of transparency and accountability in water quality testing practices and the reporting of test results. They also emphasize the need for effective oversight of water quality testing under the Rule and prompted the New Orleans Office of Inspector General (OIG) to conduct an evaluation of the Sewerage and Water Board's (S&WB) drinking water quality testing procedures.<sup>1</sup>**

**Exposure to elevated levels of lead and copper in drinking water can cause serious health effects. To regulate the levels of lead and copper in drinking water at the tap, the EPA established the Lead and Copper Rule (the Rule) in 1991. The State of Louisiana adopted the Rule into state law, giving the Louisiana Department of Health (LDH) the authority to enforce the regulation in this state.**

**The purpose of the evaluation was to determine whether or not the S&WB complied with best practices and federal regulations under the Rule during its 2010, 2013, and 2016 water quality testing cycles.**

**Evaluators found that the S&WB's failure to comply fully with federal regulations and best practices called into question the reliability of the S&WB's water quality test results. These failures were due largely to a lack of formal procedures and documentation, archaic and inefficient recordkeeping practices, and the selective disregard of the Rule's requirements.**

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<sup>1</sup> The Office of Inspector General is an oversight agency and did not conduct water quality testing.

**For example, the OIG found that the S&WB:**

- **failed to keep accurate and accessible data on the composition of service lines as directed by the Rule;<sup>2</sup>**
- **did not have an updated, verified inventory of sites that met the Rule's criteria for water quality testing;**
- **tested samples in 2010 and 2013 collected from sites not verified as valid testing sites;**
- **failed to collect 50 percent of water samples from "copper/interior lead pipe sites" (sites with copper pipes with lead solder or lead pipes in the premises plumbing) as required by the Rule and LDH; and**
- **disregarded EPA best practice guidelines that outlined appropriate procedures for sample collection at the tap, potentially underestimating lead levels in drinking water at the tap.**

**In keeping with EPA regulations and best practices and to ensure transparent, accurate, and reliable test results, evaluators provided the City and the S&WB with the following recommendations. The S&WB should:**

- **(1) develop policies and procedures for documenting the composition of service lines, and (2) provide this information to the public in an interactive web-based map as soon as the information is available;**
- **comply with the Rule's requirement to collect 50 percent of samples each testing cycle from houses that have copper pipes with lead solder or lead pipes;**
- **develop written protocols for site selection and verify sample sites each testing cycle to ensure that sites comply with the requirements of the Rule; and**
- **adopt the EPA's recommended sample collection guidance and best practices for all future testing of water quality at the tap.**

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<sup>2</sup> **Services lines are the underground pipes that supply water from the water main in the street to the property. The portion of the service line that runs under public property is the responsibility of the water system; the portion that runs under private property is the property owner's responsibility.**

**Ensuring the accuracy of lead and copper testing results under the Rule is essential to protect public health. Adoption of these recommendations should improve the integrity of the S&WB's water testing protocols and increase public confidence in the information the agency provides to consumers.**

## I. OBJECTIVES, SCOPE, AND METHODS

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**T**he Office of Inspector General of the City of New Orleans (OIG) conducted an evaluation of the Sewerage and Water Board's (S&WB) drinking water testing procedures. The purpose of the evaluation was to determine whether or not the S&WB was compliant with best practices and federal rules under the Lead and Copper Rule of the Safe Drinking Water Act. The objectives of the evaluation were to:

1. determine whether the S&WB maintained an accurate and up-to-date database of houses that contained lead pipes in the building's interior plumbing, copper pipes with lead solder, or lead service lines;
2. determine whether the S&WB complied with state and national regulations and recommended best practices with regard to selecting lead and copper test sites; and
3. determine whether policies and procedures were in place and sufficient to ensure compliance with state and national regulations and recommended best practices regarding water sample collection methods.

The scope of the inspection was limited to an assessment of S&WB policies and procedures for water quality testing during S&WB's 2010, 2013, and 2016 testing cycles.

Evaluators interviewed current and former employees of the S&WB regarding S&WB data collection and water quality testing policies and procedures under the Lead and Copper Rule (the Rule). Evaluators also interviewed experts in the field of lead poisoning and staff from the Louisiana Department of Health (LDH) Engineering Services Program.<sup>3</sup>

Additionally, evaluators reviewed:

- state and federal regulations pertaining to the federal Safe Drinking Water Act and the Rule;

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<sup>3</sup> The LDH is the primacy agency charged with regulatory oversight of S&WB water quality testing.

- studies and analyses of the Rule;
- literature on the health effects of exposure to lead and copper;
- S&WB water collection instructions provided to residents participating in water quality testing;
- internal communications by the S&WB regarding site selection;
- communications between the S&WB and LDH related to the Rule; and
- government and industry best practices for compliance with regulatory standards regarding water sample collection.

Data analyzed for this evaluation included Lead and Copper Rule 2010, 2013, and 2016 water quality test log sheets (lists showing the locations, dates, and times samples were collected each year) to determine site eligibility and compliance with the Rule. Evaluators also examined water sample collection kits distributed to homeowners for compliance with the Rule and EPA guidelines and recommendations.

Evaluators surveyed residents who participated in the water quality testing process in 2010, 2013, and 2016 regarding their understanding of the sampling process and the instructions and information provided by the S&WB. (Appendix B)

OIG staff was greatly assisted in the preparation of this report by the full cooperation of S&WB employees and officials.

This evaluation was conducted in accordance with the Principles and Standards for Offices of Inspector General for Inspections, Evaluations, and Reviews.<sup>4</sup> This report includes findings and recommendations intended to bring the S&WB into compliance with the Lead and Copper Rule and to improve the efficiency and effectiveness of the S&WB's water quality testing process under the Rule.

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<sup>4</sup> Association of Inspectors General, "Quality Standards for Inspections, Evaluations, and Reviews by Offices of Inspector General," *Principles and Standards for Offices of Inspector General* (New York: Association of Inspectors General, 2014), <http://inspectorsgeneral.org/files/2014/11/AIG-Principles-and-Standards-May-2014-Revision-2.pdf>.

## II. LEAD, COPPER, AND HEALTH

The primary sources of lead exposure come from ingesting leaded paint and soil, or inhaling dust.<sup>5</sup> However, 20 percent or more of lead exposure may come from lead in drinking water.<sup>6</sup> For bottle-fed infants, more than 50 percent of lead exposure may come from drinking water, and in some cases water may be the major source of lead exposure.<sup>7</sup> According to the Centers for Disease Control and Prevention, because paint is considered the primary source of lead exposure for children with high blood lead levels (greater than or equal to 10 µg/dL), “important nonpaint sources such as water might not be identified.”<sup>8</sup>

Ingested or inhaled lead causes serious health effects in people of all ages but especially in children.<sup>9</sup> Potential exposures to lead include lead in dust, soil, paint, and drinking water. Worldwide, long term health effects of lead exposures contributed to approximately 853,000 deaths in 2013.<sup>10</sup>

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<sup>5</sup> Mary Jean Brown and Stephen Margolis, “Lead in Drinking Water and Human Blood Levels in the United States,” *Morbidity and Mortality Weekly Report (MMWR)* 61, no. 4 (August 10, 2012): 3, [http://www.cdc.gov/mmwr/preview/mmwrhtml/su6104a1.htm?s\\_cid=su6104a1\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/su6104a1.htm?s_cid=su6104a1_w).

<sup>6</sup> 40 CFR §141.85, p. 382.

<sup>7</sup> Simoni Triantafyllidou and Marc Edwards, “Lead (Pb) in Tap Water and in Blood: Implications for Lead Exposure in the United States,” *Critical Reviews in Environmental Science and Technology* 42 (2012): 1298, <http://dx.doi.org/10.1080/10643389.2011.556556>. The contribution of water to blood lead levels is frequently minimized. Lead-based paint is defined as paint with 1 milligram of lead per square centimeter. Although leaded paint contains higher concentrations of lead than water (1.0 mg/cm<sup>2</sup> or 0.5 percent by weight), individuals ingest approximately 2 liters of water per day, far in excess of the ingested amounts of sources of lead. (Marc Edwards e-mail message to OIG, July 19, 2017.)

<sup>8</sup> Brown and Margolis, “Lead in Drinking Water,” 3; and, U.S. Environmental Protection Agency (EPA), *Lead and Copper Rule Revisions White Paper* (Washington, D.C.: EPA Office of Water, 2016), 3, [https://www.epa.gov/sites/production/files/2016-10/documents/508\\_lcr\\_revisions\\_white\\_paper\\_final\\_10.26.16.pdf](https://www.epa.gov/sites/production/files/2016-10/documents/508_lcr_revisions_white_paper_final_10.26.16.pdf).

<sup>9</sup> National Toxicology Program (NTP), National Institute of Environmental Health Sciences, *NTP Monograph on Health Effects of Low-Level Lead* (Research Triangle Park, NC: National Institute of Environmental Health Sciences, June 2012), xviii, [https://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead\\_newissn\\_508.pdf](https://ntp.niehs.nih.gov/ntp/ohat/lead/final/monographhealtheffectslowlevellead_newissn_508.pdf); Brown and Margolis, “Lead in Drinking Water,” 3.

<sup>10</sup> “Lead Poisoning and Health,” World Health Organization (WHO), reviewed September 2016, <http://www.who.int/mediacentre/factsheets/fs379/en/>.

Lead is especially harmful to the developing minds of children.<sup>11</sup> Blood lead levels (BLLs) as low as 2 µg/dL (micrograms per deciliter) have been shown to result in negative cognitive effects.<sup>12</sup> According to the Centers for Disease Control and Prevention (CDC), blood with a lead content over 5 µg/dL is considered “elevated” and has been associated with lowered IQs and academic achievement as well as behavioral problems.<sup>13</sup> The CDC has also stated that, “it is not possible to determine a threshold below which BLL [blood lead level] is not inversely related to IQ,” or cognitive defects.<sup>14</sup>

For adults, adverse health effects from lead exposure could include decreased renal function, increased blood pressure, reduced cardiovascular and renal/kidney function, and hypertension. Once ingested, lead travels quickly throughout the body in the blood before moving into the bones and teeth, where it can remain for decades.<sup>15</sup> During pregnancy and lactation, lead stored in the mother’s bones mobilizes and may be redistributed in the blood, potentially exposing the developing fetus to lead.<sup>16</sup>

The World Health Organization has further stated that “there is no known level of lead exposure that is considered safe.”<sup>17</sup>

There are also dangers associated with ingested copper. Short term exposure to excess copper can cause gastrointestinal issues such as nausea, vomiting, and

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<sup>11</sup> Ibid.

<sup>12</sup> Ronnie Levin, et al., “Lead Exposures in U.S. Children, 2008: Implications for Prevention,” *Environmental Health Perspectives* 116, no. 10 (October 2008): 1285, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2569084/pdf/ehp-116-1285.pdf>.

<sup>13</sup> Centers for Disease Control and Prevention Advisory Committee on Childhood Lead Poisoning Prevention, *Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention* (Atlanta, GA: Centers for Disease Control and Prevention, 2012), 5-6, [https://www.cdc.gov/nceh/lead/acclpp/final\\_document\\_030712.pdf](https://www.cdc.gov/nceh/lead/acclpp/final_document_030712.pdf); and, NTP, *Monograph on Health Effects of Low-Level Lead*, xviii.

<sup>14</sup> CDC, *Low Level Lead Exposure Harms Children*, 7.

<sup>15</sup> NTP, *Monograph on Health Effects of Low-Level Lead*, xviii-xxiii; Agency for Toxic Substances and Disease Registry (ATSDR), U.S. Department of Health and Human Services, *Toxicological Profile for Lead*, (Atlanta, GA: Agency for Toxic Substances and Disease Registry, 2007): 7.

<sup>16</sup> NTP, *Monograph on Health Effects of Low-Level Lead*, 10-11.

<sup>17</sup> WHO, “Lead Poisoning and Health,” 1.

diarrhea. Long term exposure or acute exposure at high dosages can cause kidney or liver damage and can be fatal.<sup>18</sup>

### LEAD AND COPPER IN DRINKING WATER

Water service lines are the underground pipes that connect the city's water mains to residential homes or other buildings. Service lines and interior plumbing may be composed of lead, galvanized steel, copper, plastic, or rubber tubing depending on when they were installed. Distribution systems serving houses built before 1950 are more likely to have lead service lines and lead in interior plumbing.

Lead service lines are the primary source of lead in drinking water. A study sponsored jointly by the American Water Works Association (AWWA) and the EPA found that "lead service lines were the major contributor to lead levels measured at the tap ...".<sup>19</sup> In 1986 the EPA banned the use of lead in any materials used to distribute drinking water due to rising concerns about the

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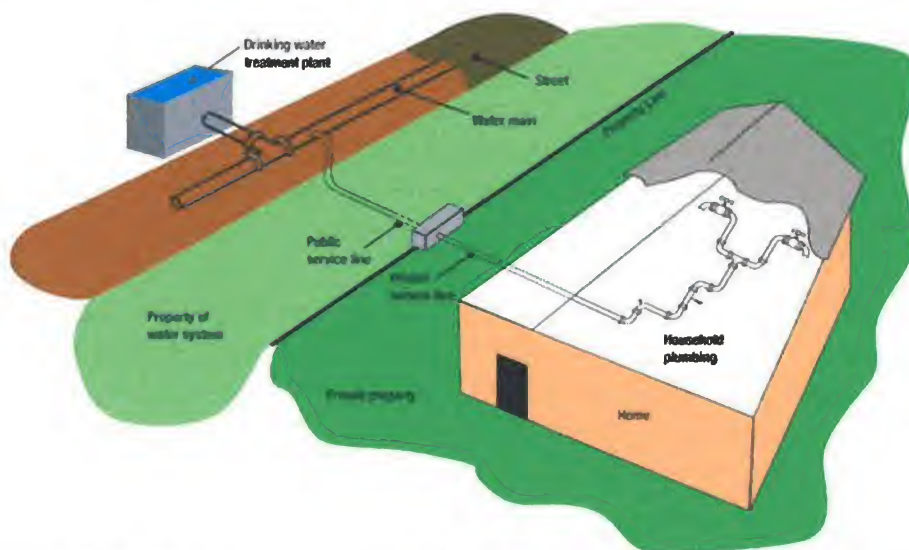
<sup>18</sup> "Table of Drinking Water Contaminants," EPA, <https://www.epa.gov/your-drinking-water/table-regulated-drinking-water-contaminants>. World Health Organization, *Copper in Drinking-water: Background Document for Preparation of WHO Guidelines For Drinking-water Quality* (Geneva: World Health Organization, 2003), 13, [http://www.who.int/water\\_sanitation\\_health/dwq/chemicals/copper.pdf](http://www.who.int/water_sanitation_health/dwq/chemicals/copper.pdf); see also, U.S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR), *Public Health Statement: Copper* (Washington D.C.: ATSDR, 2007), 5, <https://www.atsdr.cdc.gov/ToxProfiles/tp132-c1-b.pdf>; Minnesota Department of Health Division of Environmental Health, *Copper in Drinking Water* (St. Paul, MN: Minnesota Department of Health, 2005), <http://www.health.state.mn.us/divs/eh/water/factsheet/com/copper.pdf>; and EPA, *Lead and Copper Rule Revisions White Paper*, 3.

<sup>19</sup> Anne Sandvig, et al., *Contribution of Service Line and Plumbing Fixtures to Lead and Copper Rule Compliance Issues* (Denver, CO: American Water Works Research Foundation, 2008), 17, <https://archive.epa.gov/region03/dclead/web/pdf/91229.pdf>; EPA, *Lead and Copper Rule Revisions White Paper*, 5. See also, Elise Deshommes, et al., "Short- and Long-Term Lead Release after Partial Lead Service Line Replacements in a Metropolitan Water Distribution System," *Environmental Science and Technology* (August 9, 2017), 1, <http://pubs.acs.org/doi/abs/10.1021/acs.est.7b01720>; and Miguel A. Del Toral, Andrea Porter, and Michael R. Schock, "Detection and Evaluation of Elevated Lead Release from Service Lines: A Field Study," *Environmental Science & Technology* 47 (2013): 9300, <https://www.epa.gov/sites/production/files/2015-10/documents/lead-service-lines-study-20130723.pdf>.

adverse health effects related to lead in water.<sup>20</sup> However, for older cities with a significant number of lead service lines, the potential for exposure to lead in drinking water remains.

The portion of the service line from the water main to the property line is the responsibility of the water system. The portion from the property line to the home is the homeowner's responsibility.<sup>21</sup>

**Figure 1. Water distribution system from the treatment plant to household plumbing<sup>22</sup>**



Source: Original diagram by EPA, reprinted in GAO "Drinking Water," and revised by New Orleans Office of Inspector General.

<sup>20</sup> Triantafyllidou and Edwards, "Lead (Pb) in Tap Water and In Blood," 1300; Brown and Margolis, "Lead in Drinking Water," 3; and EPA, *Lead and Copper Rule Revisions White Paper*, 3.

<sup>21</sup> For more information on lead service lines, see Office of Inspector General, *Lead Exposure and Infrastructure Reconstruction*, (New Orleans, LA: OIG, 2017), 8-9 and 12-14, <http://nolaoig.gov/reports/all-reports/lead-exposure-and-infrastructure-reconstruction>.

<sup>22</sup> Government Accountability Office, *EPA Should Strengthen Ongoing Efforts to Ensure that Consumers are Protected from Lead Contamination* (Washington, D.C.: GAO, 2006), 8, <http://www.gao.gov/assets/250/248883.pdf>.

## **THE S&WB WATER DISTRIBUTION SYSTEM**

According to officials at the S&WB, the agency supplies potable water to approximately 130,000 service connections from two water distribution systems. The Carrollton Water Plant supplies about 132 million gallons of potable water per day to approximately 350,000 New Orleans residents on the East Bank of the Mississippi River. The Algiers Water Plant supplies approximately 10 million gallons of potable water per day to more than 50,000 residents of New Orleans on the west bank of the Mississippi River.<sup>23</sup>

The Sewerage and Water Board's "water source is the Mississippi River, a surface water source."<sup>24</sup> The S&WB reported in its 2016 Water Quality Report that water "leaves the Eastbank and Westbank treatment plants ... lead-free."<sup>25</sup> However, lead or copper in the distribution system and premises plumbing can leach from pipes and plumbing fixtures into drinking water at the home's tap.<sup>26</sup>

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<sup>23</sup> Sewerage and Water Board, *2016 Water Quality Report* (New Orleans, LA: S&WB, 2017), 1, <https://www.swbno.org/docs.asp>.

<sup>24</sup> *Ibid.*, 2.

<sup>25</sup> *Ibid.*, 8.

<sup>26</sup> Ronnie Levin, et al., "Lead Exposures in U.S. Children, 1285; Brown and Margolis, "Lead in Drinking Water and Human Blood," 3; EPA, *Lead and Copper Rule Revisions White Paper*, 3; and, S&WB, *2016 Water Quality Report*, 6.

### III. THE LEAD AND COPPER RULE

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The levels of lead and copper contamination allowable in drinking water are regulated by the Environmental Protection Agency (EPA). In 1974 Congress passed the Safe Drinking Water Act (the Act).<sup>27</sup> The Act gave the EPA authority to establish and enforce baseline standards on the quality of drinking water in the United States. The EPA, in turn, delegated the primary enforcement (“primacy”) of these standards to the states.<sup>28</sup>

Primacy enforcement responsibilities required that states adopt and enforce drinking water regulations “no less stringent” than the regulations promulgated by the Act.<sup>29</sup> In Louisiana, the Louisiana Department of Health (LDH) is the primacy agency that provides regulatory oversight to drinking water programs in Louisiana and enforces the provisions of the Safe Drinking Water Act.<sup>30</sup>

There have been several important amendments to drinking water regulations since the passage of the Act. In 1986 the EPA banned the use of any pipes, solder, or flux containing lead for the distribution of drinking water.<sup>31</sup> In 1991 the EPA published Subpart I of the National Primary Drinking Water Regulations, “Control of Lead and Copper,” also known as the Lead and Copper Rule (the Rule).<sup>32</sup> The Rule, which was adopted in whole by the state of Louisiana, outlined specific regulations for the control of lead and copper in drinking water, including water quality testing.<sup>33</sup>

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<sup>27</sup> Safe Drinking Water Act of 1973, 88 Stat. 1660, (1974); and Environmental Protection Agency, *Understanding the Safe Drinking Water Act* (Washington, D.C.: EPA, 2004), 1, <https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf>.

<sup>28</sup> EPA, *Drinking Water Requirements for States and Public Water Systems* (Washington, D.C.: EPA, 2017), <https://www.epa.gov/dwreginfo/primacy-enforcement-responsibility-public-water-systems>.

<sup>29</sup> Safe Drinking Water Act of 1973, 377.

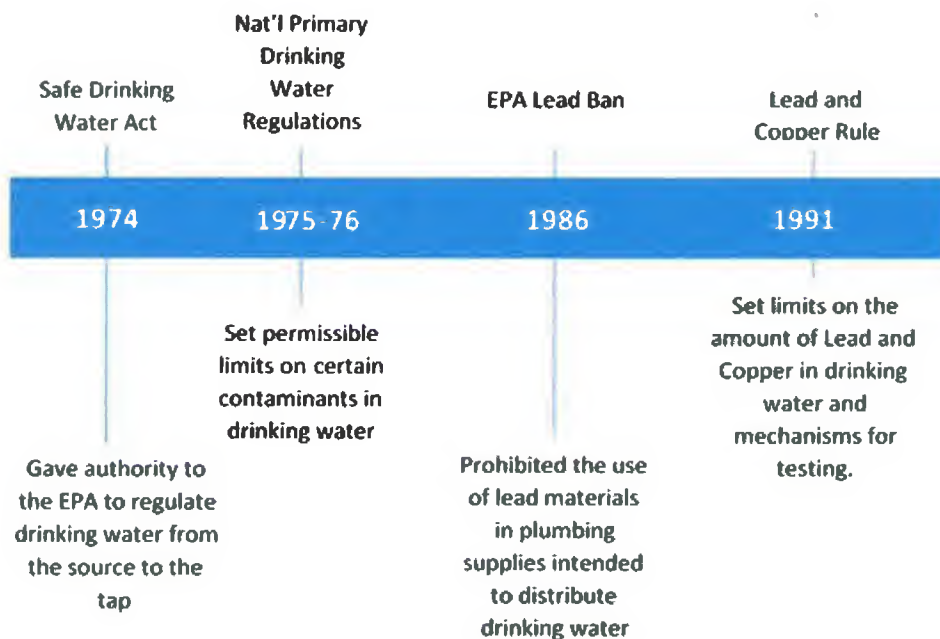
<sup>30</sup> La. Adm. Code tit. 48, Part V, §§ 7701 *et seq.*

<sup>31</sup> Flux is an acidic paste that attracts the solder into the seam between two copper pieces and bonds the pieces together. Heath Robert, “What is Flux Used for in Plumbing?” Hunker, <https://www.hunker.com/13417066/what-is-flux-used-for-in-plumbing>.

<sup>32</sup> 40 CFR §§141.80 – 141.91 (1991).

<sup>33</sup> La. Adm. Code tit. 51, Part XII, § 1701.

**Figure 2. Timeline of significant water quality regulations in the United States**



### WATER QUALITY TESTING AND REGULATORY OVERSIGHT

The Rule required public water systems to sample and test all potable water on a regular basis to assess whether or not the water met federal water quality requirements for lead and copper. Samples for drinking water quality testing must be collected in the homes of residents at the kitchen or bathroom tap.

To develop an inventory of sites eligible for water quality testing, the Rule required water systems to conduct a materials evaluation of their distribution system to identify houses that met its specific criteria.<sup>34</sup> According to the EPA:

***The tap water monitoring program for lead and copper is designed to identify those residences or sampling locations with lead service lines, lead interior plumbing, or copper pipes with lead solder.***

<sup>34</sup> The Rule required water systems to conduct an evaluation of its distribution system to identify a pool of sites eligible for testing. The EPA refers to the resulting list of addresses as the water system's "materials inventory."

Samples collected from these locations are most likely to have high levels of lead and/or copper caused by the contact of corrosive water with lead- and copper-containing plumbing materials. You are required to monitor at these *“high-risk”* locations, whenever possible ... to better ensure that high levels of lead or copper are detected ... <sup>35</sup>

By 1992 water systems had to complete and submit for approval an inventory of eligible sites at high risk for elevated levels of lead or copper in the drinking water. At a minimum the Rule required the materials evaluation to include enough sites to complete the required sampling protocols.<sup>36</sup>

The Rule identified three site categories: Tier 1, Tier 2, and Tier 3. The EPA categorized high-risk single family structures that had lead interior pipes, interior copper pipes with lead solder, or lead service lines as Tier 1 sites. If a water system did not have the requisite number of high-risk Tier 1 sites in the distribution system, it could include Tier 2 sites in its inventory; if it did not have enough Tier 2 sites, it could test at Tier 3 sites.<sup>37</sup>

The S&WB has a sufficient number of Tier 1 sites and is required to test exclusively at sites that meet Tier 1 criteria. Figure 4 outlines Tier 1, Tier 2, and Tier 3 eligibility requirements.

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<sup>35</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (Washington D.C.: EPA, 2010), 15; [emphases added], <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100DP2P.PDF?Dockey=P100DP2P.PDF>.

<sup>36</sup> 40 CFR §141.86(a).

<sup>37</sup> *Ibid.*

**Figure 3. Lead and Copper Rule tier classifications for community water systems<sup>38</sup>**

#### **Lead and Copper Rule Tier Classifications**

<b>Tier 1 Sampling Sites</b>	<b>Single family structures:</b> <ul style="list-style-type: none"><li>• that are served by a lead service line; and/or</li><li>• with copper pipes with lead solder installed after 1982 or contain lead pipes.</li></ul>
<b>Tier 2 Sampling Sites</b>	<b>Buildings, including Multiple Family Residences (MFRs):</b> <ul style="list-style-type: none"><li>• that are served by a lead service line; and/or</li><li>• with copper pipes with lead solder installed after 1982 or contain lead pipes .</li></ul>
<b>Tier 3 Sampling Sites</b>	<b>Single-family structures with copper pipes having lead solder installed before 1983.</b>

The Rule required water systems that served populations of more than 100,000 persons, such as the S&WB's Carrollton Water Plant, to test 100 sites every six months. Systems such as the Algiers Water Plant, which served 10,001 to 100,000 people, were required to sample 60 sites every six months.<sup>39</sup> However, the Rule also permitted water systems to reduce both the number of required sampling sites and the frequency of testing if test results met specific requirements.

To qualify for reduced testing under the Rule, water quality test results had to show contaminant levels below 0.005 mg/L for lead and below 0.65 mg/L for copper for two consecutive six-month testing cycles.<sup>40</sup> Systems that met these

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<sup>38</sup> Louisiana Safe Drinking Water Program, *Form C – Certification of Sample Sites* (Baton Rouge: Louisiana Department of Health, 2016), 2, [http://dhh.louisiana.gov/assets/oph/Center-EH/engineering/LCR/FormC\\_SiteCertification.doc](http://dhh.louisiana.gov/assets/oph/Center-EH/engineering/LCR/FormC_SiteCertification.doc); "A community water system is a public water system that services at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents." Based on this definition, both the Algiers system and the Carrollton system are considered community water systems. See, EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, B-1.

<sup>39</sup> According to the Rule's definition, both the Carrollton system, which serves more than 100,000 people, and the Algiers system, which serves 10,001 to 100,000 people, are large water systems.

<sup>40</sup> 40 CFR §141.86 (d)(4)(v).

requirements could perform water quality testing every three years instead of every six months. In addition, they were permitted to test half the number of samples originally required.

The S&WB met requirements for the reduced testing level in January 2002. Instead of testing every six months, it tests a total of 80 samples every three years: 50 samples from the S&WB Carrollton Plant distribution system and 30 samples from the Algiers Water Plant distribution system.

**Figure 4. Number of S&WB samples and frequency of required testing under the Rule**

Population	INITIAL REQUIREMENT		REDUCED REQUIREMENT	
	# of Samples	Testing Frequency	# of Samples	Testing Frequency
>100,000 (Carrollton)	100	Every six months	50	Every three years
10,001–100,000 (Algiers)	60		30	

#### LEAD AND COPPER RULE REVISIONS

The EPA made several minor and short-term revisions to the Lead and Copper Rule since 1991. It implemented minor revisions in 2000 and 2004 to address legal issues related to the ownership of lead service lines and to provide clarifications regarding rule implementation, respectively.<sup>41</sup>

<sup>41</sup> "Lead and Copper Rule," EPA, last modified March 15, 2017, <https://www.epa.gov/dwreginfo/lead-and-copper-rule>; EPA, *Lead and Copper Rule Minor Revisions: Fact Sheet* (Washington D.C.: EPA, 2000), <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P10051YP.txt>.

However, in the years since those revisions, the Rule has been criticized in the media for its inability to protect public health.<sup>42</sup> In 2007 the EPA implemented short term revisions to address some of the Rule's deficiencies identified in the 2005 Lead Reduction Plan.<sup>43</sup> These revisions clarified required monitoring schedules, modified qualifications for reduced monitoring, required advance approval for changes in treatment techniques, provided enhanced public education and notification, and modified requirements for lead service line replacement.<sup>44</sup>

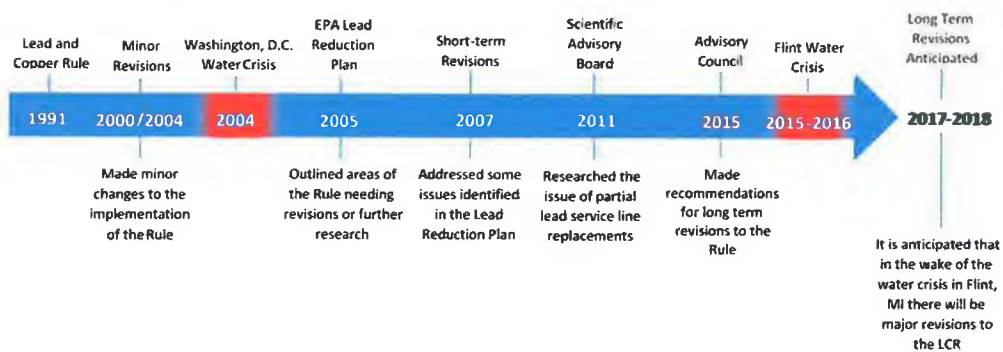
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<sup>42</sup> Dennis, Brady, "The EPA's lead-in-water rule has been faulted for decades. Will Flint hasten a change?" *Washington Post*, May 5, 2016, [https://www.washingtonpost.com/national/health-science/epas-lead-in-water-rule-has-been-faulted-for-decades-will-flint-hasten-a-change/2016/05/04/8d25bb12-0de9-11e6-bfa1-4efa856caf2a\\_story.html?utm\\_term=.593eccad4985](https://www.washingtonpost.com/national/health-science/epas-lead-in-water-rule-has-been-faulted-for-decades-will-flint-hasten-a-change/2016/05/04/8d25bb12-0de9-11e6-bfa1-4efa856caf2a_story.html?utm_term=.593eccad4985); Anna Wolfe, "EPA lead testing, record keeping requirements unclear," *The Clarion-Ledger* (Jackson, MS), May 20, 2016, [www.clarionledger.com/story/news/local/2016/04/08/epa-odds-over-lead-testing-requirements/82750632/](http://www.clarionledger.com/story/news/local/2016/04/08/epa-odds-over-lead-testing-requirements/82750632/); and Garret Ellison, "In Flint's wake, nationwide lead water testing methods questioned," *MLive.com*, January 28, 2016, [www.mlive.com/news/index.ssf/2016/01/lead\\_testing\\_methods\\_questioned.html](http://www.mlive.com/news/index.ssf/2016/01/lead_testing_methods_questioned.html).

<sup>43</sup> "Drinking Water Lead Reduction Plan—EPA Activities to Improve Implementation of the Lead and Copper Rule," EPA, March 2005, <https://nepis.epa.gov/Exe/ZyPDF.cgi/P10051WL.PDF?Dockey=P10051WL.PDF>.

<sup>44</sup> U.S. Environmental Protection Agency, *Fact Sheet: Revisions to the Regulations Controlling Lead in Drinking Water* (Washington, D.C.: EPA Office of Water, September 2007), <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=6000010Q.txt>.

**Figure 5. Lead and Copper Rule significant events and revisions**



After the Flint water crisis highlighted the continuing danger posed to public health from lead in drinking water, both the EPA and the scientific community increased their scrutiny of the Rule, contributing evidence of the Rule's shortcomings. For example, recent research demonstrated that the testing protocols required by the Rule fail to measure the amount of lead in tap water adequately. Although several recent studies indicate that more accurate data are gathered when water systems collect several samples from each site in specified intervals, the Rule required water systems to test only first draw samples.<sup>45</sup>

The EPA took actions beginning in early 2016 to strengthen safe drinking water regulations. The Agency sent letters to governors and commissioners asking each state with primacy to confirm that water systems were properly implementing the Rule and to work with water systems to locate lead service lines in their distribution systems.<sup>46</sup>

<sup>45</sup> First draw samples test the first liter of water drawn from the tap after a six-hour stagnation period during which the water supply has not been used. Del Toral, Porter, and Schock, "Detection and Evaluation of Elevated Lead Release, 9300; and, Triantafyllidou and Edwards, "Lead (Pb) in Tap Water and in Blood," 1300.

<sup>46</sup> Gina McCarthy, Administrator, EPA to Governors, February 29, 2016, <https://www.epa.gov/sites/production/files/2016-03/documents/samplelettergovernorsfeb2016.pdf>; Joel Beauvais, Deputy Assistant Administrator, EPA to Commissioners, February 29, 2016, <https://www.epa.gov/sites/production/files/2016-03/documents/samplelettercommissionersfeb2016.pdf>. The letter to "Commissioners" was directed to officials in the state agency that had primacy over the Rule at water systems.

In 2016 the EPA addressed mounting pressure to strengthen the Lead and Copper Rule's health protections in its *Lead and Copper Rule Revisions White Paper*:

There is a compelling need to modernize and strengthen implementation of the rule—to strengthen its public health protections and to clarify its implementation requirements to make it more effective and enforceable.”<sup>47</sup>

As of fall 2017, no recommended changes to the Lead and Copper Rule had been made.

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<sup>47</sup> EPA, *Lead and Copper Rule Revisions White Paper*, 3.

#### IV. DOCUMENTING THE COMPOSITION OF SERVICE LINES

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**W**hen the EPA enacted the Lead and Copper Rule in June 1991, all U.S. community water systems were required to evaluate the materials used in their distribution systems to “identify a pool of targeted sampling sites that meets the requirements of this section, and which is sufficiently large to ensure that the water system can collect the number of lead and copper tap samples required ...”.<sup>48</sup> To identify homes that met the criteria, the EPA instructed water systems to review plumbing codes, permits, inspection records, and any other documents that might identify the materials used in public or private water distribution.<sup>49</sup>

Water systems serving populations of 50,000 people or more, such as the S&WB, had to complete this evaluation by January 1, 1992.<sup>50</sup> The EPA instructed water systems to collect information on the materials used in the distribution system regularly during the course of “normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities).”<sup>51</sup>

The S&WB provided the OIG with the materials evaluation compiled in 1992 pursuant to the Rule. The materials evaluation consisted of an inventory of roughly 1,200 addresses, including approximately 600 addresses served by lead service lines.<sup>52</sup> The S&WB was not able to provide information about how the inventory was compiled.<sup>53</sup>

Representatives of the S&WB acknowledged that the 1992 materials inventory was out of date and incomplete. Moreover, the S&WB could not estimate how

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<sup>48</sup> 40 CFR §141.86(a).

<sup>49</sup> 40 CFR §141.86(a)(2). Also, EPA, *LCR Monitoring and Reporting Guidance*, 25-26.

<sup>50</sup> 40 CFR §141.86(d).

<sup>51</sup> 40 CFR §141.86(a)(2).

<sup>52</sup> The inventory consists of four separate lists of addresses including 400 houses on the East Bank with lead service lines, 400 houses on the East Bank with copper pipes and lead solder, 200 houses on the West Bank with lead service lines, and 200 houses on the West Bank with copper pipes and lead solder.

<sup>53</sup> The EPA only required water systems to keep documentation regarding the Lead and Copper Rule, including information related to the materials inventory, for 12 years. 40 CFR §141.91.

many lead service lines were in use throughout the Carrollton and Algiers water distribution systems.

S&WB officials stated that when service lines were originally installed decades ago, information on their material composition was not consistently documented. Further, the inventory was not updated to reflect changes made to service lines and interior plumbing at the sites on the list. Representatives of the agency said they could only “make an educated guess about the composition [of service lines] based on the time of installation.” S&WB officials did not know either the total number or the location of lead service lines in the city.

Lead service lines are the primary source of lead in potable water, and rising concerns about lead in water following the lead contamination of water in Flint, Michigan prompted the EPA to take action. In its 2016 communications to governors, primacy agencies, and EPA regional directors, the EPA emphasized both the importance of locating lead service lines and of ensuring that water quality testing occurred at valid locations. (Appendix A.)

The EPA asked state officials and regional EPA directors to work with water systems to provide more information to the public about the locations of lead service lines.<sup>54</sup> The communications shared best practices for increased transparency and praised states that had “identified practices and policies that enhance implementation of the [Rule],” such as updating their materials inventories and developing online databases.<sup>55</sup>

The EPA emphasized that:

Improving lead service line inventories is important in ensuring that systems are taking lead samples from valid Tier 1 sites, as required under the [Rule], as well as for effective management of risks

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<sup>54</sup> Joel Beauvais, Deputy Assistant Administrator, EPA to Association of State and Territorial Health Officials and Environmental Council of States, July 6, 2016, [https://www.epa.gov/sites/production/files/2016-07/documents/lcr\\_ashto-ecos\\_follow-up\\_letter\\_7.6.16.pdf](https://www.epa.gov/sites/production/files/2016-07/documents/lcr_ashto-ecos_follow-up_letter_7.6.16.pdf); and Peter C. Grevatt, Director, Office of Ground Water & Drinking Water, memorandum to EPA Water Division Directors, October 13, 2016, [https://www.epa.gov/sites/production/files/2016-10/documents/lcr\\_sample\\_site\\_selection\\_and\\_triennial\\_monitoring\\_wsg200.pdf](https://www.epa.gov/sites/production/files/2016-10/documents/lcr_sample_site_selection_and_triennial_monitoring_wsg200.pdf).

<sup>55</sup> Beauvais to Association of State and Territorial Health Officials, July 2016.

associated with lead service line disruption, and for providing information to customers on how to assess and mitigate risks from these lines. ... The EPA will continue to work with states to ensure that identification of the locations of LSLs [lead service lines] remains a priority for the nation's drinking water systems.<sup>56</sup>

**Finding 1: The S&WB did not have updated, reliable information on the number or locations of Lead Service Lines due to its failure to document the material composition of service lines as directed by the EPA.**

The S&WB did not comply with requirements in the Rule to update its materials evaluation in the course of "normal operations" and did not have a formal policy instructing employees to do so until late 2016. The S&WB replaced lead service lines exposed during the course of work with polyethylene tubing. However, the job's work summary only indicated that a service line was replaced. The summary did not record the material composition of the service line being replaced or document the materials that remained at the site, such as service line materials on the private side of the meter.

Failing to follow the Rule's requirement to collect information on the material composition of service lines meant that the S&WB did not have reliable, aggregate historical data. Instead it relied on file cabinets filled with paper documents about the plumbing materials used in each individual house, much of which was incomplete and out of date.

The S&WB had two record systems that contained information on the material composition of water system components: permit cards and house connection cards. House connection cards provided information on the premises' exterior connections to the water supply. Permit cards contained records of interior plumbing changes for which property owners had filed permits.

To locate documents the S&WB used a file retrieval system similar to a card catalog. Identifying records related to a specific address involved pulling

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<sup>56</sup> Ibid.

multiple pieces of documentation from both the permit office and house connections department. After completing the search, the information retrieved did not necessarily reflect the current plumbing materials used at the house.

However, the S&WB also had a Computerized Maintenance Management System (CMMS), CASS WORKS, used in the infrastructure development and maintenance industry. The S&WB used the software to create and track work orders, as well as to document field activities. However, until late 2016 the information on the material composition of service lines, if documented, was stored in comments or notes fields in CASS WORKS that could not easily be queried.

In late 2016 the S&WB began routinely documenting the material composition of service lines when crews conducted work in the field and established dedicated fields in CASS WORKS to record the data. Workers collected the information on paper forms in the field and data entry staff later input the information in on-line forms.

The S&WB's effort to document the material composition of service lines fell short on three counts. First, information collected in the database was not communicated to S&WB's water quality personnel, and laboratory staff charged with identifying and collecting samples from valid Tier 1 sites did not use the CASS WORKS program. Therefore, the information was not used to correct erroneous information in the S&WB's materials evaluation or add to its inventory of sites meeting Tier 1 criteria. Second, the S&WB had no system for recording changes to a far larger number of service lines: services lines replaced during the course of major infrastructure reconstruction projects.<sup>57</sup>

Third, between 1992 and 2016 the S&WB had not complied with the Rule's requirement to update its materials evaluation in the course of normal operations. For this reason, the S&WB had materials information for approximately 3,200 (2.5 percent) of its 130,000 service lines recorded in a searchable database as of mid-2017.

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<sup>57</sup> OIG, *Lead Exposure and Infrastructure Reconstruction*.

## THE PERMIT OFFICE

The S&WB maintained records on New Orleans residences' interior plumbing that included permit applications and inspection reports. These records provided a description of the premises, the number and types of fixtures installed, and the material composition of the interior water supply.



Permit cards were stored in file cabinets in the Permit Office. To find the permit application for a specific address required retrieving a permit card, which was stored by street name and by block (5200 block, 5300 block, etc.). Each card included the latest permit numbers for all of the houses on a specific block.

Pictured here is a permit card for one block of a single street. The left column contained the address for each home on the block. The information for each address included the plumbing permit numbers, the sewer permit number, and the inspection certificate numbers. The plumbing and sewer permit numbers were used to locate the permit application and inspection reports.

Address	Plumbing Permit	Sewer Permit	Inspection Certificate
2916-18 66138	66138	0-10001	01001
2918-20 66131	66131	0-9906	35806
2918-20 104700	104700	0-51163	96088
2526 63816	63816	0-7529	61819
5218-20 66131	66131	0-7529	61819



Permit records, including application and inspection reports, were filed in a separate bank of file cabinets by permit number. Each file drawer contained several expandable envelopes containing a range of permit applications filed in alphanumeric order. Each new permit application was assigned a new permit number, and all old inspection reports were then moved from their previous location and filed under the new number with the new application.

This system of record maintenance could only be a source of accurate information if customers applied for plumbing permits. However, any work that was completed without a permit was not documented in the S&WB records, leaving gaps in the record. Additionally, all permit records that had not been updated with new permit numbers since 1960 were lost in Hurricane Katrina.

### HOUSE CONNECTIONS DEPARTMENT

The S&WB also had historical data on the location and types of materials used to connect residences to the city's water mains. This information was kept on house connection cards.



Similar to the process used to locate permit records, locating house connection cards began by identifying the house connection number associated with a specific address. House connection numbers were unique identifiers assigned to each address at the time the water service was connected. As with the permit

cards, house connection numbers were written or typed on cards stored by street name and block in large file cabinets.



Pictured to the left is a connection card for one block of Danny Drive in Algiers. In the left column is the street number for each house on the block. The next column notes the sewer connection number and the third column lists the house connection number.



The house connection number was then used to locate another file cabinet in which the house connection cards were stored. House connection cards were organized in groups of 100 according to the date they were created.

Data found on house connection cards included the name of the property owner, the address of the property, the date of meter installation, the location of the meter on the property, the type of meter installed, the material composition of the service line when originally installed, and the name of the plumber who installed the meter.

**Figure 6. House connection card, front and back**

The S&WB used the house connection records to identify the location of the service lines connecting residences to the city's water mains, but changes in the service line material were not usually documented. If a service line was changed in the course of a repair or water main replacement, the house connection card would not be updated to reflect the change. The house connection card was only updated if there was a change in service line location or a new water meter installation.

The S&W's archaic, multi-step process of searching paper records was inefficient and ineffective, permitting the analysis of only a single property at a time. The lengthy process also effectively discouraged using the information buried in the paper records for the purpose of updating the materials inventory. As a result,

the S&WB's incomplete and unreliable information on the locations of lead service lines left it unable to alert citizens who might be at risk of exposure to lead in tap water.

For decades the S&WB ignored the Rule's instructions to collect information on the material composition of elements of its water system in the course of normal operations. For this reason it was not able to comply with the EPA's recent best practice recommendations. These recommendations called for water systems to compile reliable and complete materials inventories and to provide residents with information about the locations of lead service lines to reduce risks associated with lead contamination.

S&WB's lack of knowledge about the locations of lead service lines in the city placed the health of citizens at risk, particularly during infrastructure reconstruction. The S&WB plans multiple capital projects that involve replacing water mains across the city and the S&WB requires contractors to replace all publicly-owned service lines when water mains are replaced.<sup>58</sup> However, the replacement of only a portion of a lead service line, a partial lead service line replacement, creates the potential for increased exposure to lead in tap water.<sup>59</sup>

**Recommendation 1: The S&WB should (1) develop policies and procedures for completing a comprehensive materials inventory that captures the material composition of all service lines in the city on both the private and public sides of the property line, and (2) make this information available to the public in an interactive web-based map.**

Recent communications from the EPA stressed the need for "transparency and accountability in the implementation of the Lead and Copper Rule to assure the public that all levels of government are working together to address lead risks."<sup>60</sup>

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<sup>58</sup> "Projects," RoadWork NOLA, <https://roadwork.nola.gov/projects/>.

<sup>59</sup> OIG, *Lead Exposure and Infrastructure Reconstruction*, 21.

<sup>60</sup> McCarthy to Governors, February 29, 2016.

Letters from the EPA urged water systems to improve their inventories of lead service lines to ensure testing from valid Tier 1 sites and provide that information on their websites.<sup>61</sup>

Further, officials at the LDH stated that water systems should continuously inventory their distribution systems using information obtained through routine system inspections and by consulting logs of maintenance, repairs, and replacements. All changes in the materials in the distribution systems should be documented and materials inventories updated.

#### DEVELOPING A COMPREHENSIVE SERVICE LINE MATERIALS INVENTORY

The S&WB should develop a formal, written policy for the creation of a comprehensive materials inventory, including data collected in the field during routine work, information currently housed in permit and house connections records, and documentation of service line replacements done during infrastructure reconstruction. The policy should be consistent with best practices for inventory development and electronic records management.

For example, the S&WB should consider the recommendations provided by the EPA in its 2010 *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems*.<sup>62</sup> The document provides water systems with guidance on conducting materials evaluations and reiterates the sources of information that should be reviewed. These sources included:

- plumbing codes;
- plumbing permits;
- distribution maps and drawings;
- inspection and maintenance records;
- meter installation records;
- capital improvement and master plans;
- standard operating procedures;

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<sup>61</sup> Beauvais to ASTHO and ECOS, July 6, 2016; Beauvais to State Commissioners, February 29, 2016.

<sup>62</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 25-26.

- operation and maintenance manuals;
- permit files;
- existing water quality data;
- interviews with senior personnel, building inspectors, and retirees; and
- community survey data.

Compiling existing data is also consistent with national and best practice standards according to the American Water Works Association (AWWA) and the Lead Service Line Replacement Collaborative (Collaborative).<sup>63</sup> The Collaborative developed and released an online toolkit in January 2017 with targeted strategies for community leaders, public health professionals, drinking water professionals, elected officials, and consumers engaged in advocacy related to lead service line replacement.

The toolkit includes recommendations for determining the locations of lead service lines and developing an inventory that begins with researching the resources listed above. It also provides additional information related to each resource, including the pros and cons of each type of documentation and where the information might be located. In addition, the toolkit offers written guidance and the decision map shown below for identifying communities more likely to have lead service lines.<sup>64</sup> Finally, the toolkit has recommendations for integrating ongoing data collection on locations of lead service lines with historical data.<sup>65</sup>

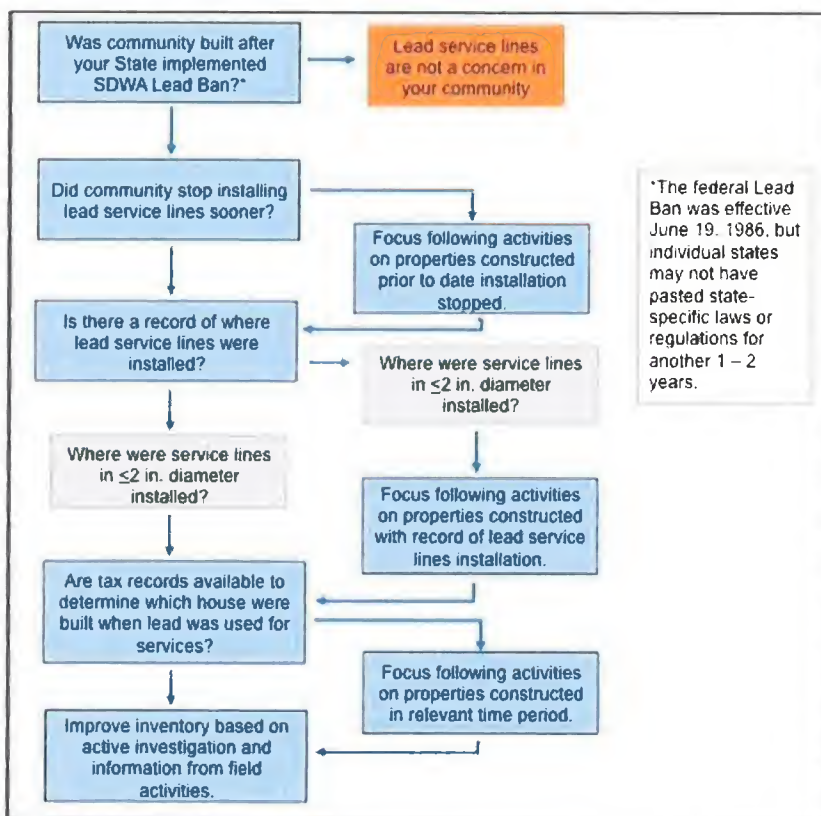
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<sup>63</sup> The American Water Works Association is a professional organization that provides recommendations and standards for the design, operation, and management of water treatment and distribution facilities. See, <https://www.awwa.org/about-us.aspx>. AWWA publishes the *Journal of American Water Works* and several manuals for best practices in water works. Additionally, the State of Louisiana has adopted AWWA's standards for chemical treatments to all potable water. See Adm. Code tit. 51, Part XII, §325. AWWA is also a Steering Committee member of the LSLR Collaborative, a joint project using a transdisciplinary approach to address the issue of lead service lines. The Collaborative's 24 member organizations include water industry, public health, environmental, infrastructure, housing, and government groups.

<sup>64</sup> "Preparing an Inventory," LSLR Collaborative, <http://www.lslr-collaborative.org/preparing-an-inventory.html>.

<sup>65</sup> "Integrating Data Collection into Ongoing Activities," LSLR Collaborative, <http://www.lslr-collaborative.org/integrating-data-collection-into-ongoing-activities.html>.

**Figure 7. Preparing an inventory: where do we start?**

Source: Lead Service Line Replacement Collaborative<sup>66</sup>

In light of the Rule’s guidelines and best practice recommendations by the EPA, AWWA, and the Collaborative, any policy developed by the S&WB to update its materials inventory should include a plan to review and extract existing data. Although there are gaps in the data currently stored on paper at the S&WB, a review of the information in the S&WB’s immediate custody would provide a baseline of information on the materials in the distribution system and guide future efforts to document the location of lead service lines.

<sup>66</sup> "Preparing an Inventory: Where Do We start?," Lead Service Line Replacement Collaborative, <http://www.lslr-collaborative.org/preparing-an-inventory-where-do-we-start.html>.

## **DATA STORAGE AND ELECTRONIC RECORD MANAGEMENT**

Additionally, the S&WB should conform to best practices and industry standards in data storage and electronic record management. The CASS WORKS software package selected by the S&WB should have the ability to store and access data remotely, as well as to retrieve and analyze the data stored.

However, prior to late 2016 the S&WB had not configured CASS WORKS to collect and analyze information on service line materials. The information obtained about service line materials was deposited in comment fields, which could not be aggregated or readily queried. The S&WB now has separate fields for recording the relevant data points in the database, which should make the relevant data retrievable, but the process can be further improved.

The software package should also be accessible to employees working in the field so that data on service line materials can be updated on site. In late 2016 employees began documenting work activity on paper forms and the information was entered into CASS WORKS by data entry personnel. The two-step process required data entry personnel to decipher the handwritten information created in the field and later enter it into a database, increasing the likelihood of lost information, miscommunication, and data entry errors. Providing employees the ability to enter data remotely should ensure greater accuracy and increase efficiency.

Representatives of the S&WB stated that one of the challenges related to onsite data entry was that the networking systems used by the S&WB were not integrated with those used by the City of New Orleans. The S&WB should work with the city's Internet Technology Department to overcome this and other technological barriers to accessing and entering data into CASS WORKS remotely.

## **PUBLICLY AVAILABLE INTERACTIVE MAP OF LEAD SERVICE LINES**

In a letter dated February 29, 2016, the EPA asked each state and water system to post copies of their inventories to their public websites for increased

transparency.<sup>67</sup> In response to the letter, many states and water systems informed the EPA of efforts they had made to increase public awareness of lead service lines in the distribution system.

Based on those responses, the EPA identified as a best practice the development of searchable websites that enabled customers to identify the material composition of their service lines. The EPA urged water systems that had not already done so to develop searchable maps to increase transparency and mitigate the risk of exposure to elevated lead levels.<sup>68</sup>

The Collaborative also endorsed this practice, stating that:

On-line maps showing what is known and, just as importantly, not known about the service line is a significant first step. Making the information publicly available in familiar mapping formats ... should encourage people to find out whether a property has [a lead service line] and keep the utility informed so that it has the latest information.<sup>69</sup>

The Collaborative recognized that information on service lines should be posted even if data on lines “installed decades ago” are likely “imperfect,” and noted that liability concerns could be overcome with disclaimers.<sup>70</sup>

Consistent with this recommendation and EPA advice, a number of cities have developed interactive maps using data gathered from meter installation records, permit applications, service connection records, and other data available to the water system.<sup>71</sup> The webpages include disclaimers notifying customers that the information provided may not be accurate and that the maps would be updated regularly as additional information became available.

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<sup>67</sup> Beauvais to Commissioners, February 29, 2016.

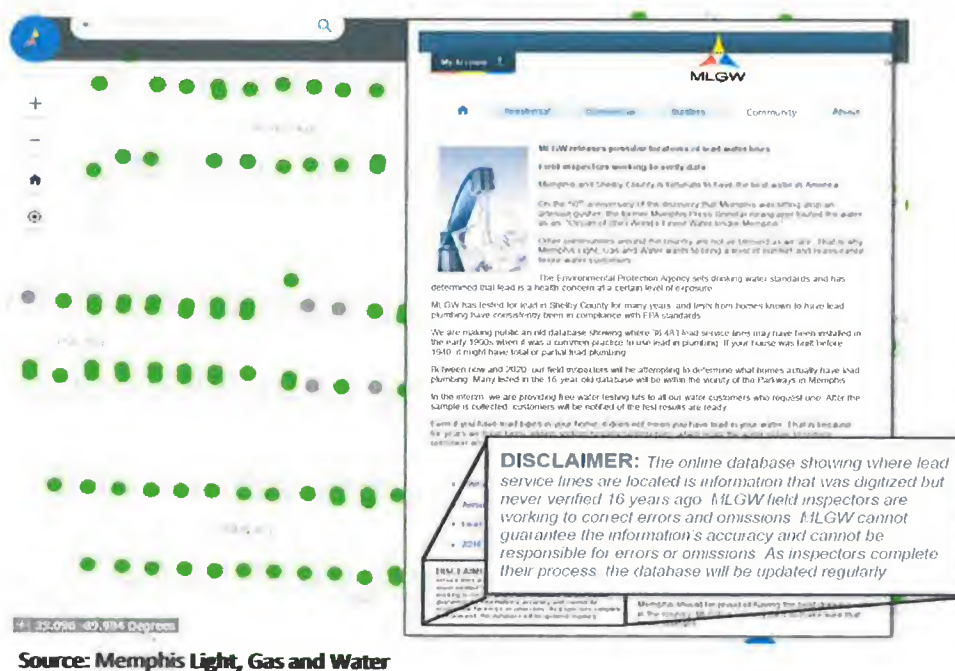
<sup>68</sup> Joel Beauvais to Association of State and Territorial Health Officials, July 2016.

<sup>69</sup> “Helping Consumers Make Informed Decisions,” Lead Service Line Replacement Collaborative, <http://www.lslr-collaborative.org/helping-consumers.html>.

<sup>70</sup> Ibid.

<sup>71</sup> A few of the cities that have developed interactive maps include Memphis, TN (Figure 9); Washington, D.C. (<https://www.dwater.com/servicemap/>); Columbus, Ohio (<https://www.columbus.gov/Templates/Detail.aspx?id=2147495118>); and Cincinnati, Ohio (<http://cincinnati-oh.gov/water/lead-information/>).

**Figure 8. Example of lead service line map with disclaimer from Memphis Light, Gas and Water<sup>72</sup>**



In March 2016 the OIG mailed surveys to participants in the 2016 water quality testing cycle. (Appendix B.) Approximately 94 percent of survey respondents indicated that they either (1) did not have a lead service line (19 percent), (2) they did not know if they had a lead service line (69 percent), or (3) left the answer blank (6 percent). As will be discussed in Finding 3, the S&WB confirmed that nearly all of the 2016 participants had lead service lines. This is a further indication of the need for transparency.

In keeping with the EPA's recommendation and best practices endorsed nationally by multiple health, environmental, and water industry groups, the S&WB should update its website to provide customers with an interactive map of the material composition of service lines. The initial data for the map should

<sup>72</sup> "Lead Service Database," Memphis Light, Gas and Water, [www.mlgh.com/lead servicedatabase](http://www.mlgh.com/lead servicedatabase).

**consist of information that the S&WB currently has regarding service lines, even if it is limited and not confirmed.**

**The site should be updated regularly as data are obtained in the development of a comprehensive materials inventory, including historical data from S&WB records and any updated information collected during the course of maintenance or infrastructure work. The S&WB's goal should be to enable residents to enter their addresses and retrieve the material composition of both the public and private portions of their service lines.**

## V. TESTING AT SITES WITH COPPER AND LEAD INTERIOR PIPES

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**W**ater quality testing samples from sites with copper pipes with lead solder or lead interior pipes test the amounts of lead and copper attributed to the plumbing inside a structure. Premise plumbing, the network of pipes inside a building, can be composed of lead, copper, steel, galvanized iron, plastic tubing, or brass.<sup>73</sup> Premise plumbing is solely the responsibility of the property owner.<sup>74</sup>

**Figure 9. Copper premise plumbing with lead solder**



Photo by Hephaestos at en.wikipedia<sup>75</sup>

Although lead contamination has received more attention in the media due to high water lead levels in Washington, D.C. and Flint, Michigan, elevated copper levels in water are also a health concern. For this reason, the Rule required water systems with lead service lines to draw 50 percent of their samples from sites with lead service lines and 50 percent of their samples from sites with interior plumbing that included either lead pipes or copper pipes with lead solder (copper/interior lead pipe sites).<sup>76</sup>

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<sup>73</sup> National Research Council, *Drinking Water Distribution Systems: Assessing and Reducing Risks* (Washington, D.C.: National Academies Press, 2006), 318, [http://www.kysq.org/docs/DWDS\\_NAS.pdf](http://www.kysq.org/docs/DWDS_NAS.pdf).

<sup>74</sup> *Ibid.*, 322.

<sup>75</sup> Hephaestos, "Waterpipes," 2004, *Wikipedia*, <https://commons.wikimedia.org/wiki/File:Waterpipes.jpeg>.

<sup>76</sup> 40 CFR §141.86(a)(8).

Only houses with copper pipes installed after 1982 qualified as Tier 1 copper/interior lead pipe sites. The Rule required community water systems to develop materials inventories by 1992 that included a sufficient number of potential water quality testing sites with both lead service lines and with copper or lead interior plumbing.

**Finding 2: The S&WB failed to collect 50 percent of samples from copper/interior lead pipe sites for the 2010, 2013, and 2016 testing cycles as required by the Rule.**

The S&WB's 1992 materials inventory listed approximately 600 copper/interior lead pipe sites in New Orleans. The Rule required the S&WB to collect 80 Lead and Copper Rule water samples in total, 50 samples from the Carrollton distribution system and 30 samples from the Algiers distribution system. Since both the Carrollton and Algiers distribution systems had lead service lines, the Rule required half the samples from each distribution system to come from sites with lead service lines and the other half from copper/interior lead pipe sites.

However, the percentage of samples taken from copper/interior lead pipe sites for the 2010, 2013, and 2016 water quality testing cycles consistently fell below 50 percent. A comparison of the S&WB's water quality testing sample logs to the 1992 materials inventory showed that in 2010 known copper/interior lead pipe sites comprised 30 percent of samples collected in Algiers.<sup>77</sup> This number increased to 45 percent in 2013 but fell to 11 percent in 2016.<sup>78</sup>

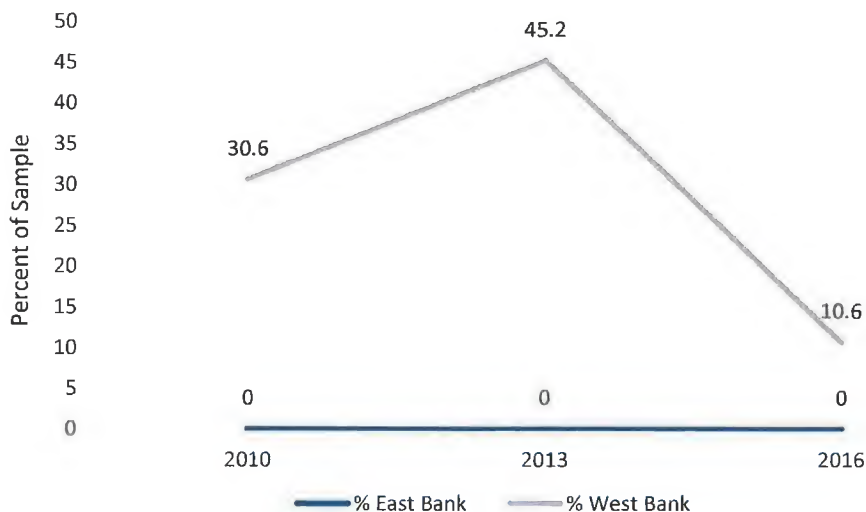
In the 2010, 2013, and 2016 testing cycles, the S&WB tested zero (0) samples from residences identified on the materials inventory as copper/interior lead pipe sites in the Carrollton Water System.

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<sup>77</sup> Evaluators compared the addresses on the S&WB materials inventory with the addresses on the sample logs to determine the percentage of sample sites that the S&WB had identified in the materials inventory as copper sites.

<sup>78</sup> The S&WB collected several samples in each testing cycle for which the material composition of the site was not documented. In 2016 six (6) sites were identified as sites with copper/interior lead pipes, but only five (5) of these sites came from the materials inventory. The S&WB did not verify the material composition of the sixth site identified as a site with copper/interior lead pipes.

**Figure 10. Percentage of Lead and Copper Rule samples drawn from known copper/interior lead pipe sites**



S&WB staff acknowledged that they had “not always been able to collect [from] 50 percent lead and 50 percent copper” sites and stated that the Carrollton sample pool consisted primarily of houses serviced by lead service lines.

S&WB staff explained that when the materials inventory was completed in 1992, the 400 copper sites in the Carrollton distribution system were located in New Orleans East, an area of the city that was severely damaged by Hurricane Katrina in 2005. S&WB officials assumed that most of the homes in this area were substantially renovated in the aftermath of the storm and that the copper pipes in those homes had been replaced.<sup>79</sup> The agency did not have enough staff after the storm to inspect plumbing renovations completed in all of the city’s houses.

According to the S&WB lab manager, “I did not do any additional verification for that. ... And no, I didn’t go back and look at those plumbing records.” As a result, S&WB officials did not know whether those homes on the inventory were still valid Tier 1 sites with copper plumbing.

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<sup>79</sup> Only homes with copper pipes with lead solder installed between 1982 and before Louisiana’s lead ban in 1988 were eligible as Tier 1 sites.

However, the S&WB had not identified new copper/interior lead pipe sites in the Carrollton distribution system since Hurricane Katrina in 2005 and conceded that there was no formal policy for locating copper/interior lead pipe sites. Moreover, S&WB officials' clarification of why it did not have an inventory of Tier 1 copper/interior lead pipe sites in the Carrollton distribution system failed to explain why the S&WB tested fewer than 50 percent copper/interior lead pipe sites in the Algiers distribution system in the 2010, 2013, and 2016 testing cycles. In fact, in the 2016 testing cycle, the S&WB tested only six (6) copper sites in the Algiers distribution system.

S&WB officials made a deliberate decision not to test copper/interior lead pipe sites in clear contradiction to the Rule. S&WB representatives stated that they focused on sites with lead service lines in both the Carrollton and Algiers systems because they believed there was little risk of copper contamination in the water: the Mississippi River was not considered corrosive so copper corrosion should not be a concern.

S&WB officials noted that the risk of *lead* exposure had primarily been in houses with lead service lines, not copper pipes; they had not seen elevated lead levels in houses with copper pipes and lead solder. In addition, they believed that the copper testing requirement in the Rule may soon change. However, officials at the Louisiana Department of Health (LDH), which has regulatory authority over drinking water programs in Louisiana, disagreed, stating that there had been "a lot more" copper exceedances in Louisiana than lead exceedances.

LDH officials communicated to OIG evaluators that the law did not provide "any exception for allowing more lead service lines in the sampling pool" and that water systems were required to collect samples at copper/interior lead pipe sites.<sup>80</sup> Further, officials from LDH stated that they expect water systems to follow the law as written. LDH recognized that, due to the passage of time, water systems may not be able to identify a sufficient number of sites to meet the 50

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<sup>80</sup>LDH Compliance Engineer, e-mail to the New Orleans Office of Inspector General, September 26, 2016.

percent requirement for Tier 1 copper/lead pipe sites. However, state regulators confirmed that there should be a good faith effort to identify these sites.<sup>81</sup>

An October 2016 EPA memorandum reiterated regulations regarding the selection of sample sites and clarified the meaning of “insufficient Tier 1 sites.”<sup>82</sup> The memorandum noted that the Rule’s definition of “insufficient sites” referred to the number of sites in the water system’s distribution system, not the number of sites in the materials inventory. The memorandum repeated the Rule’s original instructions: “If the materials evaluation is insufficient ... the system shall seek to collect such information where possible in the normal course of its operations.”<sup>83</sup>

The S&WB provided no evidence that there was an insufficient number of copper/interior lead pipe sites in the Carrollton distribution system and had made no attempt to identify new copper/interior lead pipe sites since 2005. Instead, S&WB officials assumed that the list of sites on the original materials inventory was no longer valid following Hurricane Katrina and decided to eliminate testing at copper/interior lead pipe sites in the Carrollton distribution system. Likewise, S&WB did not provide any documentation showing that there was an insufficient number of copper/lead pipe sites in the Algiers distribution system.

By discounting the potential risk of exposure to elevated levels of copper and not testing at copper/interior lead pipe sites, S&WB officials undermined a stated purpose of the Rule and potentially understated copper levels in New Orleans drinking water.

The purpose of the Rule is to protect public health by monitoring the amounts of lead and copper in drinking water.<sup>84</sup> This goal can only be accomplished if the testing procedures and results provide reliable data about how much lead and copper is in the tap water. In fact, an official at LDH emphasized the need for

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<sup>81</sup> Interview with Chief Engineer in LDH Engineering Services, October 13, 2017.

<sup>82</sup> Grevatt to EPA Water Division Directors.

<sup>83</sup> *Ibid.*, 2.

<sup>84</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 3.

**“accurate information.” The S&WB’s failure to meet the Rule’s sampling requirements casts doubt on the reliability of its copper test results.**

**Recommendation 2: The S&WB should comply with the Rule’s requirement that 50 percent of samples each testing cycle must come from houses that have copper pipes with lead solder or lead pipes.**

**The S&WB should make every effort to comply with the provisions of the Rule and the LDH’s requirement that 50 percent of water quality samples come from Tier 1 copper/interior lead pipe sites. Toward that end, the S&WB should develop a formal policy that identifies sample site selection procedures designed to meet this requirement.<sup>85</sup>**

**As outlined in Finding 1, the S&WB should:**

- 1. develop formal, written policies and procedures for collecting this information in the course of normal repairs, maintenance, and infrastructure reconstruction;**
- 2. review plumbing codes, permits, inspection records, and other documents that could provide information on the materials used in the public distribution system or private plumbing; and**
- 3. conduct a comprehensive materials evaluation that inventories the materials used throughout both distribution systems.**

**LDH officials stated that water systems in cities such as New Orleans where there have been significant changes in the housing stock should complete a new evaluation of the entire distribution system. LDH officials further stated that, consistent with the Rule, this process should be completed through a review of maintenance and repair logs as well as through ongoing service line inspections in the course of normal operations.<sup>86</sup>**

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<sup>85</sup> 40 CFR §141.86(a)(8).

<sup>86</sup> Ibid., 25-26.

## VI. SAMPLE SITE SELECTION

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**T**he Rule required a water system to use its materials inventory to identify valid Tier 1 sites from which samples could be drawn.<sup>87</sup> It also clearly stipulated that the materials inventory must include a large enough pool of sites to ensure that the water system can collect the required number of samples.<sup>88</sup> Moreover, the water system “shall collect each ... tap sample from the same sampling site from which it collected a previous sample.”<sup>89</sup>

Officials from the Louisiana Department of Health (LDH) noted that the Rule required systems to test at the same location for each cycle in order to establish a baseline for water quality and identify changes in water quality over time. LDH officials stated that if water systems changed sites with each testing cycle, it would be difficult to attribute changes in sample results to variations in system-wide water quality rather than to a change at a single sample site.

However, the EPA further instructed that:

If [a water system] cannot gain access to an original sampling site during any subsequent monitoring period (e.g., the homeowner no longer wishes to participate in the sampling program), [the water system] must collect a tap water sample from another site which meets the same targeting criteria as the original site. The replacement site should be located within reasonable proximity of the original site.<sup>90</sup>

The Rule required water systems to replace sample sites that were no longer available for testing with sites in the same tier classification.<sup>91</sup> Since the S&WB’s materials inventory consisted only of Tier 1 sites, all replacement sites must also

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<sup>87</sup> Water systems were permitted to collect samples Tier 2 sites only if a system had documented that there was an insufficient number of Tier 1 sites. If there were not enough Tier 1 and Tier 2 sites, Tier 3 sites could be sampled.

<sup>88</sup> 40 CFR 141.86 (a).

<sup>89</sup> 40 CFR 141.86 (b)(4).

<sup>90</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 28; and 40 CFR 141.86 (b)(4).

<sup>91</sup> *Ibid.*

be Tier 1 sites. To verify the site was eligible for testing, water system employees needed to determine if the site had a lead service line or was a valid copper site.

In the absence of reliable records, determining that a site had a lead service line could involve digging a small hole approximately one foot deep next to the water meter so that the line could be visually inspected to verify its material composition. If the inspection could not be performed because the service line was covered with hard surfacing (such as concrete) and “inaccessible,” the lead service line could not be confirmed and the site could not be used to replace a former lead service line site.

Verifying that a site qualified as a copper site required S&WB employees to conduct a physical inspection of the interior plumbing of residence built between 1982 and 1988 to confirm that it contained lead pipes or copper pipes with lead solder. Finally, all replacement sites had to be in reasonable proximity to the sites they were replacing in order to be eligible for sampling.<sup>92</sup>

The S&WB had no formal policy or protocols that guided the selection of water quality testing participants; however, the process typically began with sending all residents who had participated in the previous testing cycle a letter inviting them to participate again. Officials at the S&WB stated that they often had difficulty getting enough residents to agree to participate in the testing for multiple test cycles; frequently participants did not respond to invitations to participate in subsequent tests.

To replace these sites, the S&WB sent letters and made phone calls to participants from prior testing cycles, dropped sample kits at prior participants’ homes, went door to door to request participation from new sites, or solicited participation from Sewerage and Water Board employees.<sup>93</sup> The process may

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<sup>92</sup> 40 CFR 141.86 (b)(4).

<sup>93</sup> For example, in 2016 the S&WB began by inviting participation from residents who were tested in 2013. They received an insufficient number of replies and then turned to residents who had been tested in the 2010 and prior testing cycles.

have also included sending invitations to other addresses from the 1992 materials inventory.<sup>94</sup>

However, in 2016 the S&WB revised its procedures in an effort to increase participation in its 2016 water quality testing. In addition to mailing targeted letters to prior participants and sampling at the homes of employees, the S&WB also tried to build a new participant pool by providing water sampling kits to citizens at community meetings or leaving them on front porches in neighborhoods that might be serviced by lead service lines. The S&WB collected samples from anyone who agreed to participate.

**Finding 3: The S&WB did not verify that sites not on the 1992 materials inventory were valid Tier 1 sites; as a result, it collected samples at invalid testing sites.**

A review of the logs from each testing cycle revealed that S&WB replaced a large number of sample sites each year with sites that were not in the 1992 materials inventory. In 2010 and 2013 approximately 30 percent of samples came from residences that were not on the S&WB 1992 materials inventory. In 2016 nearly 70 percent of samples were from sites not on the 1992 materials inventory.

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<sup>94</sup> The S&WB confirmed the lack of formal protocols for the process: according to the lab manager, “No, there is no written formal policy.” In the absence of formal protocols, S&WB officials’ description of the process contained discrepancies. For example, it was unclear whether the materials inventory was consistently used to solicit water quality testing participants if participants from the previous testing cycle declined to participate or did not respond to the S&WB’s request.

**Figure 11. Percent 1992 materials inventory vs. non-materials inventory sample collection sites**



Representatives of the S&WB told evaluators that, for each testing cycle, its practice had been to inspect all new sites that had not previously been tested prior to sampling to ensure that they qualified as Tier 1 sites.<sup>95</sup> However, for the 2016 testing cycle, the S&WB collected samples from anyone who wished to participate before verifying those locations were Tier 1 sites.

Once the 2016 samples had been collected, the S&WB sent employees to verify the material composition of services lines of all participants from that year, including the sites from any previous test cycle and those on the original materials inventory. The agency stated that this was done because there was “obviously some validity” to the assertion that lead service lines could have been removed since the last testing cycle.

The S&WB collected 260 samples as part of the Rule testing in 2016. The S&WB was able to confirm that 101 of the 260 samples collected in 2016 came from sites with lead service lines. An additional six of the samples were identified as copper sites on the 1992 materials inventory. This left a total of 107 valid

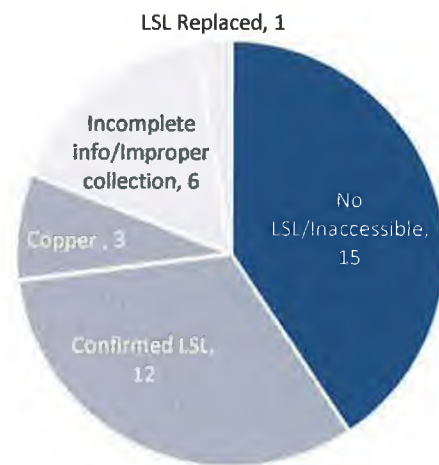
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<sup>95</sup> Employees only performed inspections to determine the material composition of service lines. The S&WB had no process for verifying the composition of premise plumbing.

samples in 2016. The remaining 153 sites were deemed invalid for various reasons and were not submitted for official testing.<sup>96</sup>

Thirty-seven (37) of the 260 samples were from sites that had previously been tested in 2013. The S&WB verified that 12 of the 37 sites tested in 2013 had lead service lines. However, 15 of the 2013 test sites either had an inaccessible service line or did not have a lead service line at the meter in 2016; 3 were copper sites. The S&WB had also used samples from 12 of the 15 ineligible sites in 2010.

**Figure 12. Of the 37 sites sampled in 2013 and 2016, 15 had no lead service line or were inaccessible in 2016**



The fact that the S&WB sampled at multiple sites in 2010 and 2013 that could not be verified in 2016 or were found to be ineligible as Tier 1 sites raised two questions. First, did the S&WB conduct site verification years prior to 2016 as it

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<sup>96</sup> Most of the samples were invalidated because there was no lead service line present when checked or the lead service line was inaccessible for confirmation. However, a number sites were also invalidated because the sample was improperly collected, the resident had not completed the sample information sheet correctly, or the lead service line had been previously replaced. The S&WB sent the samples from sites deemed invalid to a private lab for testing and provided the results to residents.

asserted?<sup>97</sup> If not, it is possible that the S&WB tested samples from non-Tier 1 sites in all prior testing cycles.

Second, were the test results from those years valid? Homes had to meet specific criteria to qualify for water quality testing under the Rule. These requirements were intended to capture homes at high risk of exposing residents to lead or copper in tap water, but test results for 2010 and 2013 included sites that did not meet the criteria for high-risk Tier 1 sites.<sup>98</sup>

S&WB officials confirmed that it had “no formal written policy” for water quality testing beyond what was stated in the Rule. The legislation permitted water systems to change test sites if necessary, but it gave no specific guidance on how to select the new site except that it should select a site from the original materials inventory; if none were available, it must be in close proximity to the previous site and be in the same Tier classification.<sup>99</sup> In the absence of more specific instructions from the EPA, the S&WB adopted a process that did not consistently identify and document the validity of new Tier 1 sample sites.

**Recommendation 3:** The S&WB should develop written protocols for site selection and verification of all sample sites in each testing cycle to ensure that samples comply with the requirements of the Rule.

Identifying a sufficient number of valid sites for water quality sampling should be possible. The S&WB’s water testing took place every three years, and it had been on the same water quality testing schedule since January 2002. The S&WB was required to sample at 80 sites between June 1 and September 30, 2016 from its approximately 130,000 service connections and submit the samples to the LDH within 14 days of collection.

However, in 2016 the S&WB did not begin sampling for testing under the Rule until late August, and it collected most of the samples in September 2016. S&WB

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<sup>97</sup> The S&WB did not provide documentation of site verification in 2010 and 2013.

<sup>98</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 24.

<sup>99</sup> 40 CFR §141.86(a)(1) and (b)(4).

documents revealed that the agency scrambled up to the September 30 deadline to collect samples and perform site verifications.

In 2016 the S&WB passed out test kits at community events without first obtaining information about whether sites might meet the Rule's requirements. S&WB crews were sent to residences after samples were taken to determine the material composition of service lines. This practice was both inefficient and ineffective. Approximately 60 percent of samples received did not qualify as Tier 1 sites.

In addition, representatives from the S&WB stated on multiple occasions that the agency collected samples at the homes of employees, which was confirmed by an examination of the log sheets. In 2013 samples from the homes of employees comprised nearly 10 percent of those collected. A review of the 2016 data also revealed that several employees participated in the testing, including the head of the agency at the time.

The S&WB should develop written protocols for sample site identification that would enable it to sample from verified Tier 1 sites each test cycle. In keeping with the Rule, if the S&WB is not able to identify enough sample sites in a given test cycle by soliciting participants from prior testing, the protocol should direct the S&WB to attempt to replace sites that are no longer available with sites on the 1992 materials inventory.

However, given the absence of reliable records, the policy should include protocols for site verification of addresses on the materials inventory.<sup>100</sup> The 2016 inspection revealed that the S&WB used samples from several sites that no longer had lead service lines, were on the 1992 materials inventory, and had been sampled in several recent test cycles. To avoid testing ineligible sites, the S&WB should verify that no plumbing changes have occurred and that sites on the materials inventory are still Tier 1 sites prior to each test cycle.

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<sup>100</sup> In some years, the S&WB asked participants whether or not there had been major plumbing work performed at the residence within the prior three years. However, responses depended on the memory or knowledge of homeowners, some of whom may not have lived at the residence during the prior testing cycle.

The protocol should also provide guidance about how to identify new sites not on the 1992 inventory that met the required criteria. Protocols for the selection of all new sites should include a review of all known information about potential test sites, including data on house connection cards, permit applications and reports, and information stored in CASS WORKS.

Finally, S&WB's policy for sample site selection and verification should include requirements for documenting data collection. S&WB representatives informed evaluators that employees verifying the material composition of service lines relayed the information to the lab conducting water quality testing via e-mail or phone call. However, the communications could not be confirmed because they were not recorded in a permanent, retrievable record.

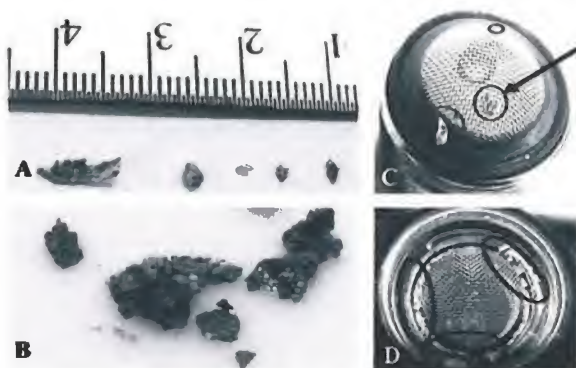
All data on the material composition of service lines should be collected and stored electronically in accordance with efforts to conduct a systematic review of the entire distribution system as discussed in Recommendation 2. Further, laboratory staff should be trained in the use of the database so that information can be used by them to locate valid Tier 1 sites.

## VII. SAMPLE COLLECTION TECHNIQUES

**L**ead in water is generally described as either dissolved or particulate. Dissolved lead is soluble lead created by a chemical reaction between corrosive water and lead pipes or lead solder. It is also undetectable to the eye. Lead particulates are small, visible pieces of lead that detach from pipes and become mobile in the water.

Lead particulates flow through premise water and can reattach to pipes, be caught in the joints and crevices of interior plumbing, be caught by faucet aerators, or pass through the aerator into tap water.<sup>101</sup>

**Figure 13. Lead particles found in water faucet aerators, measured in micrometers**



Source: Triantafyllidou and Edwards, 2012<sup>102</sup>

<sup>101</sup> Water Research Foundation, *Controlling Lead in Drinking Water* (Newport News, Virginia: 2015), 4, <http://www.waterrf.org/PublicReportLibrary/4409.pdf>. An aerator is a fixture with fine screening that attaches to the faucet spout. Aerators often catch lead particles that are too large to pass through their screening, potentially contaminating water as it passes through the aerator. EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 27.

<sup>102</sup> "Lead-bearing particles were identified as the cause of severe tap water contamination during field investigations. (A and B) Brass particles trapped in two different strainers adjacent to two drinking water fountains at the University of North Carolina at Chapel Hill (Elfland et al., 2010). (C) Lead solder particles trapped in home faucet aerator screen in Washington, DC (Edwards, 2005). (D) Lead solder particles trapped in home faucet aerator screen in Greenville, North Carolina (Triantafyllidou et al., 2007)," cited in Triantafyllidou and Edwards, "Lead in Tap Water and in Blood," 1317.

In its 2010 *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems*, the EPA stated that removing and cleaning aerators in anticipation of testing could result in false measures of the amount of lead typically released from the tap. One of the document's appendices was a set of sample documents for "water system owners and operators." One of the sample documents was a set of suggested instructions for homeowners titled "Suggested Directions for Homeowner Tap Sample Collection Procedures (Revised 9/2006)."<sup>103</sup> The EPA provided water systems with the following description of its sample instruction document:

This page provides suggested language that you can use when instructing homeowners on the proper procedure for collecting lead and copper tap samples. These directions (step 3) were *amended on September 2006 to instruct homeowners to not remove an aerator prior to sampling* [emphasis added].<sup>104</sup>

In fact, number three in the list of instructions to participants included the language: "Do not remove the aerator prior to sampling." In February 2016 the EPA sent Water Division Directors a newly revised version of "Suggested Directions" that repeated the 2010 instruction not to remove the aerator prior to sampling.<sup>105</sup> (Appendix C.)

The February 2016 memo also informed state primacy agencies and water systems that samples should be collected in bottles with wide mouths. EPA's guidance reinforced a January 2016 recommendation from the Flint Drinking Water Task Force that water systems only use wide-mouth bottles.<sup>106</sup>

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<sup>103</sup> EPA, *Lead and Copper Rule Monitoring and Reporting Guidance*, 29 and Appendix D.

<sup>104</sup> Ibid.

<sup>105</sup> Grevatt to EPA Water Division Directors. The memo restated a recommendation made in a 2006 memo titled *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule*: "public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples." The "Suggested Directions" intended for distribution to participants included the more explicit direction: "Do not remove aerators prior to sampling."

<sup>106</sup> EPA Flint Drinking Water Task Force, *Use of Wide-mouth Sample Bottles*, [https://www.epa.gov/sites/production/files/2016-04/documents/use\\_of\\_wide-mouth\\_sample\\_bottles\\_ftf\\_16-1.pdf](https://www.epa.gov/sites/production/files/2016-04/documents/use_of_wide-mouth_sample_bottles_ftf_16-1.pdf).

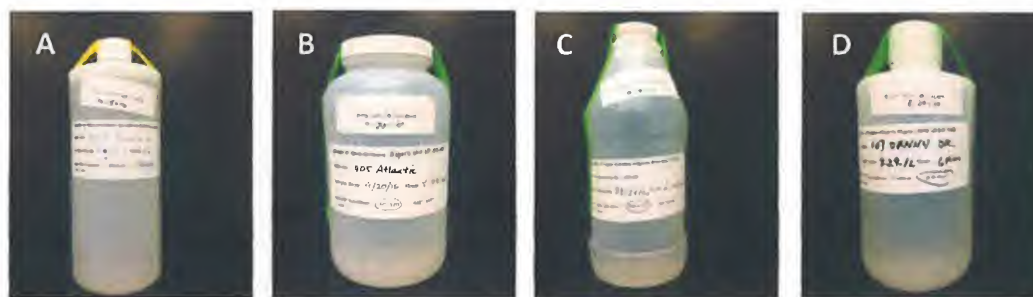
In its memo the EPA stated that “wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water. In addition, a higher flow rate can result in greater release of particulate and colloidal lead ...”<sup>107</sup>

**Finding 4: The S&WB failed to follow EPA recommendations regarding sample collection techniques, potentially reducing the validity of its water quality test results.**

S&WB instructions to 2010 and 2013 participants in water quality testing did not include a direct statement reminding participants not to remove aerators in keeping with the “Suggested Directions” provided by the EPA. The S&WB also failed to include this instruction in 2016 following the EPA’s memo with an updated “Suggested Directions” attached that reiterated the instruction. Because S&WB did not include such a statement, some residents may have removed aerators, thereby potentially reducing lead levels in water samples collected from the tap.

In addition, the S&WB did not exclusively use wide-mouth bottles for water quality testing. The OIG obtained photos of each sample bottle submitted in 2016. The photos revealed that the S&WB provided participants with one of four different types of bottles to collect samples, and only one of the bottles had a wide mouth.

**Figure 14. Photos of sample bottles used for lead and copper testing in 2016.**



<sup>107</sup> Grevatt to EPA Water Division Directors.

**Figure 15. Percentage of 2016 samples collected using each bottle type**

<b>Bottle Type</b>	<b>Carrollton</b>	<b>Algiers</b>	<b>Total</b>
<b>A (Narrow mouthed)</b>	<b>38.3</b>	<b>14.9</b>	<b>28.0</b>
<b>B (Wide-mouthed)</b>	<b>25.0</b>	<b>29.8</b>	<b>27.1</b>
<b>C (Narrow mouthed)</b>	<b>28.3</b>	<b>36.2</b>	<b>31.8</b>
<b>D (Narrow mouthed)</b>	<b>8.3</b>	<b>19.1</b>	<b>13.1</b>

Less than 30 percent of the samples collected in 2016 were collected using wide-mouth bottles. As a result, test results for the majority of houses tested may have registered lower lead levels than those typically experienced by residents.

**Recommendation 4: The S&WB should adopt the sample collection practices recommended by the EPA for all future testing to ensure accurate and reliable test results.**

The EPA published multiple guidelines for Rule compliance and has provided clarifications and best practices for sample collection techniques, especially in the wake of the water crisis in Flint, Michigan. These guidelines and best practices were designed to increase the accuracy of lead and copper testing results. The S&WB should use sample collection techniques that conform to EPA's best practice guidelines to ensure that its testing protocols are in accordance with EPA recommendations and that test results accurately represent the amount of lead and copper in the water.

Toward that end, the S&WB should adopt and use the sample collection techniques suggested by the EPA: the S&WB should (1) use wide-mouth bottles exclusively to collect water samples for testing, and (2) include explicit instructions to participants not to remove aerators prior to testing.

## VIII. CONCLUSION

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**T**he processes used by water systems to assess the amount of lead and copper in drinking water are critical to protecting the health of citizens. Evaluators found that the S&WB did not comply with all regulations for water quality testing under the Lead and Copper Rule (Rule) or adopt important best practices and recommendations provided by the EPA. The adoption of these practices should increase transparency about the locations of lead service lines and help ensure the reliability of water quality testing under the Rule.

The issues identified by evaluators primarily stemmed from the fact that there were no internal controls at the S&WB guiding the processes used to test water for lead and copper. Employees stated that there were no written policies for how to proceed beyond what was stated in the Rule, a dense piece of legislation that has been widely criticized for its inability to protect health.

Evaluators found that the S&WB did not have an updated inventory of sites that met the criteria for testing under the Rule. In part because the inventory was out of date and incomplete, and in part because S&WB officials determined that testing for copper was not necessary, the S&WB failed to follow regulations regarding the required number of sites with copper or interior lead pipes. Instead, the agency decided to focus primarily on locations with lead service lines.

Further, the lack of written policies led to inconsistent practices regarding how to select and verify new sites that met the criteria for sampling. As a result, the S&WB submitted samples to LDH for water quality testing under the Rule that were not verified as Tier 1 sites in the 2010 and 2013 testing cycles. Finally, evaluators found that the S&WB failed to adopt best practice guidelines for sample collection techniques designed to improve the accuracy of sample results.

Evaluators provided the City and the S&WB with the following recommendations to improve compliance with the Rule and to help the S&WB improve the transparency, accuracy, and effectiveness of its water quality sampling practices in a manner consistent with best practices. The S&WB should:

- **(1) develop policies and procedures for completing a comprehensive materials inventory that captures the material composition of all service lines in the city on both the private and public sides of the property line, and (2) make this information available to the public in an interactive web-based map.**
- **comply with the Rule's requirement that 50 percent of samples each testing cycle must come from houses that have copper pipes with lead solder or lead pipes.**
- **develop written protocols for site selection and verification of all sample sites in each testing cycle to ensure that samples comply with the requirements of the Rule.**
- **adopt the sample collection practices recommended by the EPA and suggested as best practices for all future testing to ensure transparent, accurate, and reliable test results.**

**The S&WB should take steps to ensure the integrity of the water testing protocols to increase public confidence in the information it provides to consumers. More important, ensuring the integrity of testing procedures and the reliability of lead and copper testing results under the Rule is essential to protect public health.**

# APPENDIX A. EPA MEMOS TO STATE AND REGIONAL OFFICIALS



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

## SAMPLE LETTER

THE ADMINISTRATOR

Dear Governor:

There is no higher priority for the U.S. Environmental Protection Agency (EPA) than protecting public health and ensuring the safety of our nation's drinking water. Under the Safe Drinking Water Act (SDWA), «State» and most other states have the primary responsibility for the implementation and enforcement of drinking water regulations, while EPA is tasked with oversight of state efforts. Recent events in Flint, Michigan and other U.S. cities, have led to important discussions about the safety of our nation's drinking water supplies, which is why I am writing to you today.

I am asking you to join me in taking action to strengthen protection of our nation's drinking water, which is a shared responsibility involving state, tribal, local and federal governments, system owners and operators, consumers and other stakeholders. We must work together to address the broad set of challenges and opportunities we face – including in the areas of infrastructure finance and investment, science, technology, legacy and emerging contaminants, regulatory oversight, risk assessment and public engagement and education.

As part of the EPA's immediate effort to properly oversee state implementation of the Lead and Copper Rule, my staff will be meeting with every state drinking water program across the country to ensure that states are taking appropriate actions to identify and address lead action level exceedances and fully implementing and enforcing this important rule. I ask that you encourage your state agency to give this effort the highest priority, consistent with our shared commitment and partnership to address lead risks.

In the near-term, I also ask for your leadership in taking action to enhance public transparency and accountability in the implementation of the Lead and Copper Rule to assure the public that all levels of government are working together to address lead risks. By separate letter, the EPA's Office of Water has written to the head of your state primacy agency detailing our requests and recommendations. In that letter we urge enhanced efforts to provide the public with better and quicker information on risks associated with lead in drinking water and how to abate them. We also ask states to promptly inform residents of lead sample results from their homes, as well as the general public where systems are experiencing high lead levels. And we point out the tremendous value of using public websites to disclose state lead sampling protocols and guidance, lead sampling results, and water system inventories of lead service lines. This is the most effective approach to assure the public that we are doing everything we can to work together to address lead risk, and I would ask your support to take these steps quickly.

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In the coming weeks and months, we will be working with states and other stakeholders to identify strategies and actions to improve the safety and sustainability of our drinking water systems, including:

- ensuring adequate and sustained investment in, and attention to, regulatory oversight at all levels of government;
- using information technology to enhance transparency and accountability with regard to reporting and public availability of drinking water compliance data;
- leveraging additional funding sources to finance maintenance, upgrading and replacement of aging infrastructure, especially for poor and overburdened communities; and
- identifying technology and infrastructure to address both existing and emerging contaminants.

Thank you in advance for your support to ensure that we are fulfilling our joint responsibility for the protection of public health and to restore public confidence in our shared work to ensure safe drinking water for the American people. Please do not hesitate to contact me, and your staff can always contact Mark Rupp, Deputy Associate Administrator for Intergovernmental Relations, at [rupp.mark@epa.gov](mailto:rupp.mark@epa.gov) or (202) 564-7178.

As always, the EPA appreciates your leadership and engagement as a partner in our efforts to protect public health and the environment.

Sincerely,

Gina McCarthy



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

## SAMPLE LETTER

October 19, 2017

OFFICE OF  
WATER

Dear Commissioner:

There is no higher priority for the U.S. Environmental Protection Agency than protecting public health and ensuring the safety of our nation's drinking water. Under the Safe Drinking Water Act (SDWA), «State» and other states have the primary responsibility for the implementation and enforcement of drinking water regulations, while the EPA is tasked with oversight of state efforts. Recent events in Flint, Michigan, and other U.S. cities, have led to important discussions about the safety of our nation's drinking water supplies. I am writing today to ask you to join in taking action to strengthen our safe drinking water programs, consistent with our shared recognition of the critical importance of safe drinking water for the health of all Americans.

First, with most states having primacy under SDWA, we need to work together to ensure that states are taking action to demonstrate that the Lead and Copper Rule (LCR) is being properly implemented. To this end, the EPA's Office of Water is increasing oversight of state programs to identify and address any deficiencies in current implementation of the Lead and Copper Rule. EPA staff are meeting with every state drinking water program across the country to ensure that states are taking appropriate actions to address lead action level exceedances, including optimizing corrosion control, providing effective public health communication and outreach to residents on steps to reduce exposures to lead, and removing lead service lines where required by the LCR. I ask you to join us in giving these efforts the highest priority.

Second, to assure the public of our shared commitment to addressing lead risks, I ask for your leadership in taking near-term actions to assure the public that we are doing everything we can to work together to address risks from lead in drinking water. Specifically, I urge you to take near-term action in the following areas:

- (1) Confirm that the state's protocols and procedures for implementing the LCR are fully consistent with the LCR and applicable EPA guidance;
- (2) Use relevant EPA guidance on LCR sampling protocols and procedures for optimizing corrosion control;
- (3) Post on your agency's public website all state LCR sampling protocols and guidance for identification of Tier 1 sites (at which LCR sampling is required to be conducted);
- (4) Work with public water systems – with a priority emphasis on large systems – to increase transparency in implementation of the LCR by posting on their public website and/or on your agency's website;

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- the materials inventory that systems were required to complete under the LCR, including the locations of lead service lines, together with any more updated inventory or map of lead service lines and lead plumbing in the system; and
- LCR compliance sampling results collected by the system, as well as justifications for invalidation of LCR samples; and

(5) Enhance efforts to ensure that residents promptly receive lead sampling results from their homes, together with clear information on lead risks and how to abate them, and that the general public receives prompt information on high lead levels in drinking water systems.

These actions are essential to restoring public confidence in our shared work to ensure safe drinking water for the American people. I ask you for your leadership and partnership in this effort and request that you respond in writing, within the next 30 days, to provide information on your activities in these areas.

To support state efforts to properly implement the LCR, the EPA will be providing information to assist states in understanding steps needed to ensure optimal corrosion control treatment and on appropriate sampling techniques. I am attaching to this letter a memorandum from the EPA's Office of Ground Water and Drinking Water summarizing EPA recommendations on sampling techniques. We will also be conducting training for state and public water systems staff to ensure that all water systems understand how to carry out the requirements of the LCR properly. Finally, we are working to revise and strengthen the LCR, but those revisions will take time to propose and finalize; our current expectation is that proposed revisions will be issued in 2017. The actions outlined above are not a substitute for needed revisions to the rule, but we can and should work together to take immediate steps to strengthen implementation of the existing rule.

While we have an immediate focus on lead in drinking water, we recognize that protection of the nation's drinking water involves both legacy and emerging contaminants, and a much broader set of scientific, technical and resource challenges as well as opportunities. This is a shared responsibility involving state, tribal, local and federal governments, system owners and operators, consumers and other stakeholders. Accordingly, in the coming weeks and months, we will be working with states and other stakeholders to identify strategies and actions to improve the safety and sustainability of our drinking water systems, including:

- ensuring adequate and sustained investment in, and attention to, regulatory oversight at all levels of government;
- using information technology to enhance transparency and accountability with regard to reporting and public availability of drinking water compliance data;
- leveraging funding sources to finance maintenance, upgrading and replacement of aging infrastructure, especially for poor and overburdened communities; and
- identifying technology and infrastructure to address both existing and emerging contaminants.

As always, the EPA appreciates your leadership and engagement as a partner in our efforts to protect public health and the environment. Please do not hesitate to contact me, or your staff may contact Peter Grevatt, Director of the Office of Ground Water and Drinking Water at [grevatt.peter@epa.gov](mailto:grevatt.peter@epa.gov) or (202) 564-8954.

Thank you in advance for your support to ensure that we are fulfilling our joint responsibility for the protection of public health and to restore public confidence in our shared work to ensure safe drinking water for the American people.

Sincerely,

Joel Beauvais  
Deputy Assistant Administrator

Enclosure



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

**JUL - 6 2016**

OFFICE OF WATER

Edward P. Ehlinger, President  
Sharon Moffatt, Interim Executive Director  
Association of State and Territorial Health Officials  
2231 Crystal Drive Suite 450  
Arlington, VA 22202

Martha Rudolph, President  
Alexandra Dunn, Executive Director  
Environmental Council of States  
50 F Street, NW, Suite 350  
Washington, DC 20001

Dear ECOS and ASTHO leaders:

I am writing to follow up on your members' responses to the EPA's February 29, 2016, letters to state primacy agencies asking that states continue to work collaboratively with the EPA to address deficiencies and improve transparency and public information regarding the implementation of the Lead and Copper Rule (LCR).

At this time, every state has expressly confirmed – either in its initial response to the February 29 letters or in follow-up communications with the EPA – that state protocols and procedures are fully consistent with LCR and applicable EPA guidance, including protocols and procedures for optimizing corrosion control, and that the state has already posted or will post state LCR sampling protocols and guidance to their public websites. The EPA staff will be following up with every state to ensure that these protocols and procedures are clearly understood and are being properly implemented to address lead and copper issues at individual drinking water systems, and to offer EPA assistance if needed. In addition, the EPA staff will continue to engage with states to ensure that lead action level exceedances and LCR violations are promptly and appropriately addressed.

Many of the responses from state commissioners identified practices and policies that enhance the implementation of the LCR and increase public transparency. I encourage all states to continue to learn from one another and to implement best practices that strengthen public health protections. To this end, I would like to highlight some of the promising practices identified in state responses:

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*Promoting Transparency at State and Public Water Systems:*

- A substantial number of states report that they are already posting individual lead compliance sampling results, not just 90<sup>th</sup> percentile values, on their public websites utilizing Drinking Water Watch or similar database tools.
- Some drinking water systems are providing online searchable databases that provide information on known locations of lead service lines, or providing videos that show homeowners how to determine whether their home is served by a lead service line.

*Shortening Reporting and Notice Timeframes*

- Some states have adopted more stringent timelines for water systems to provide consumer notices to all who receive water from sites that were sampled and resulted in a lead action level exceedance. While the LCR allows up to 30 days, some states are requiring notice to consumers as quickly as 48 hours after sampling.
- Some states require laboratories that analyze lead compliance samples to contact the state within 24 hours of confirming that a sample analysis has exceeded the 15 parts per billion action level for lead.

*Enhancing Rule Implementation:*

- Several states are requiring their public water systems to update their “materials evaluations”, to increase understanding of lead service line locations and ensure an adequate pool of “Tier 1” locations (meaning locations with known lead service lines or lead plumbing) for LCR compliance sampling.
- Several states are identifying funding mechanisms, such as the Drinking Water State Revolving Fund (DWSRF), to help communities replace lead service lines by providing principal forgiveness and low interest loans and/or maximizing the DWSRF set-asides to fund corrosion control studies when an action level exceedance is triggered.

*Additional Actions*

- Several states are working with local drinking water systems to partner with local school boards and departments of education to sample and replace old drinking water fountains and fixtures at schools.
- Some states are increasing the availability of water testing, health screenings and blood lead level testing to residents.

Although many states have provided examples of best practices that go beyond the minimum rule requirements, other states have identified challenges with some of these same activities. In particular, a number of states identified problems with posting individual lead samples because of limited information technology resources and/or concerns with privacy and security. However, the substantial number of states that are posting individual sample results indicates that these challenges can be overcome. The EPA believes that posting of individual


sampling results is important for public transparency and intends to work with states that are not yet posting individual sample results – to share lessons learned from states that are already doing so, and to urge all states to adopt this practice.

We are concerned that many states have identified challenges related to lead service line inventories. Improving lead service line inventories is important in ensuring that systems are taking lead samples from valid Tier 1 sites, as required under the LCR, as well as for effective management of risks associated with lead service line disruption, and for providing information to customers on how to assess and mitigate risks from these lines. We are encouraged that some states have identified examples of systems providing online searchable databases of lead service lines, or have committed to working with systems to develop updated inventories. The EPA will continue to work with states to ensure that identification of the locations of LSLs remains a priority for the nation's drinking water systems.

The EPA recognizes that there is also important work to be done to strengthen the LCR, and we look forward to working with the states as we develop the proposed rule revisions. In the interim, the EPA will continue to work closely with the states to ensure that the proper steps are being taken to implement the current rule and protect the public from harmful exposures to lead and copper in drinking water. The EPA strongly encourages states to continue to seek effective strategies and actions to improve address lead in drinking water. Continuing to enhance public transparency and accountability is critical to reassure the public of our continuing work to protect the nation's drinking water.

Again, thank you for your active engagement in this important effort. Please do not hesitate to contact me, or Mark Rupp, Deputy Associate Administrator for the EPA's Office of Intergovernmental Relations, at [rupp.mark@epa.gov](mailto:rupp.mark@epa.gov) or 202-564-7178.

Sincerely,



Joel Beauvais  
Deputy Assistant Administrator

cc: Peter Grevatt, Director, Office of Ground Water and Drinking Water, US EPA  
Jim Taft, Executive Director, Association of State Drinking Water Administrators



OFFICE OF  
WATER

**MEMORANDUM**

SUBJECT: Implementation of the Lead and Copper Rule Provisions Related to Sample Site Selection and Triennial Monitoring

FROM: Peter C. Grevatt, Director  
Office of Ground Water & Drinking Water

TO: Water Division Directors  
Regions I-X

As part of EPA's on-going oversight responsibilities, the Office of Ground Water and Drinking Water (OGWDW) has worked with the Regions to conduct a thorough review of implementation of the Lead and Copper Rule (LCR). One area that requires additional attention relates to compliance sampling site selection and the use of tier 1 sites by community water systems (CWSs). I ask that you and your primacy agencies ensure that implementation of the LCR is consistent with the rule requirements discussed below and that this information is well-documented. I also request that you and your primacy agencies pay close attention to the documentation the agency will expect to have available during program reviews regarding future primacy agency decisions to approve requests from public water systems seeking to return to triennial monitoring<sup>1</sup> after a lead action level exceedance.

Tier 1 Sample Site Selection

Under the current LCR, the CWSs are required to identify and use tier 1 sites for their compliance monitoring under 40 CFR §141.86. When a system no longer has enough tier 1 sites in its sample pool to meet the minimum number of samples (e.g., due to plumbing changes or lack of homeowner participation), the system must identify other tier 1 sites to add to its sample pool.

<sup>1</sup> Systems serving more than 50,000 persons and small and medium systems with state-defined optimal water quality parameters must receive written approval from the primacy agency to return to reduced monitoring after a lead action level exceedance. 40 CFR § 141.86(d)(4)(vi)(B).

Tier 1 sampling sites are defined in the LCR as “single family structures<sup>2</sup>” that contain “copper pipes with lead solder installed after 1982 or contain lead pipes; and/or served by a lead service line.”<sup>3</sup> As required under 40 CFR §141.86(a), all sites used for lead and copper compliance tap sampling must be tier 1 sites unless there are “insufficient tier 1 sampling sites.” The phrase “insufficient tier 1 sampling sites” refers to sites in the distribution system. It does not refer to the sites currently in the sample pool.

Under the LCR, CWSs are required to identify a pool of targeted sampling sites that is sufficiently large to ensure the water system can collect the number of samples required in §141.86(e). The regulations at 40 CFR §141.86(a) (1) and §141.42(d) in Subpart E of Part 141, require water systems to develop a materials evaluation to identify the requisite number of tier 1 sites. The regulations at 141.86(a)(2) also state that the system is required to take additional measures “in order to identify a sufficient number of sampling sites” if the materials evaluation is insufficient. Specifically, the regulations state “... the system shall seek to collect such information where possible in the course of its normal operations (e.g., checking service line materials when reading water meters or performing maintenance activities): (i) All plumbing codes, permits, and records in the files of the building department(s) which indicate the plumbing materials that are installed within publicly and privately owned structures connected to the distribution system; (ii) All inspections and records of the distribution system that indicate the material composition of the service connections that connect a structure to the distribution system; and (iii) All existing water quality information, which includes the results of all prior analyses of the system or individual structures connected to the system, indicating locations that may be particularly susceptible to high lead or copper concentrations.”

In some cases, materials evaluations may not have been sufficiently robust to meet the targeted sampling site requirements of the rule or they may need to be updated. To ensure that a public water system is able to accurately identify the presence of tier 1 sites, the public water system should periodically update its materials evaluation to capture any recent changes to the available sites for sampling. For example, such updates would be opportune when distribution system maintenance projects occur. Several states have informed us that they are already requiring their public water systems to update their materials evaluations. EPA strongly recommends that public water systems maintain and submit upon request to their primacy agency documentation to confirm that the system periodically updates its materials evaluation including a description of the sources used to update this information.

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<sup>2</sup> Where multi-family structures make up more than 20 percent of the structures served by the system, those types of structures may be used instead of single family structures.

<sup>3</sup> Congress enacted the Safe Drinking Water Act Amendments of 1986 that included a prohibition on the use of pipe, solder, or flux that are not lead free in potable applications, including public water systems. Existing EPA guidance clarifies that tier 1 sites for solder generally should have ages between 1982 and the effective date of the lead ban in States (42 U.S.C. 300g-6). *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems*, page 25: Document # EPA 816-R-10-004, March 2010

#### Eligibility for Triennial Tap Monitoring for Lead after an Action Level Exceedance

Any water system approved for reduced tap monitoring must return to standard monitoring if it exceeds the action level according to 40 CFR §141.86(d)(4)(vi). To return to triennial monitoring, public water systems will need to complete two rounds of 6-month sampling and two years of annual monitoring with 90<sup>th</sup> percentile results below the action level.<sup>4</sup> For systems serving more than 50,000 persons and small and medium systems with state-defined optimal water quality parameters, the primacy agency must provide written approval for a system to return to reduced monitoring per 40 CFR §141.86(d)(4)(vi)(B).

EPA Regions should act in their oversight capacity, to clearly communicate the expectation that primacy agencies will critically consider relevant aspects of a water system's LCR program including corrosion control treatment and historical performance before granting triennial monitoring. In addition, where the primacy agency finds that a public water system is lacking in technical, managerial, and financial capacity, the primacy agency could decide to keep the system on an annual LCR monitoring schedule. Regions should communicate the expectation that primacy agencies will be prepared to provide appropriate documentation of the relevant factors taken into consideration when making decisions to approve or disapprove triennial monitoring for those systems subject to primacy agency approval. Regions should also communicate the importance of primacy agencies maintaining existing documentation supporting past decisions to approve a reduced monitoring schedule for systems that are required to obtain state written approval and have previously experienced concerns with lead in drinking water, such as systems that were approved for a reduced monitoring schedule soon after they had reported an action level exceedance. In accordance with 40 CFR §142.14(d)(5), primacy agencies must retain records of their monitoring frequency decisions, including the monitoring results and other data supporting the decision, the primacy agencies' findings based on the supporting data and any additional bases for such decision. Additional primacy agency record keeping requirements specific to the LCR are located at 40 CFR §142.14(d)(8).

EPA Regions should also communicate the expectation that the primacy agency will work with the water system to ensure they are identifying and addressing the root cause(s) of action level exceedances before the system commences or returns to triennial monitoring. For those systems which require written state approval, EPA expects that primacy agencies will be prepared to provide documentation demonstrating that they have reviewed those systems prior to approving a reduced monitoring schedule, to determine whether any additional factors exist that call into question the appropriateness of reduced monitoring, and to revise a system's eligibility as necessary for ensuring public health protection.

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<sup>4</sup> If a system has 90<sup>th</sup> percentile lead levels of less than or equal to 0.005 mg/L and 90<sup>th</sup> percentile copper levels of less than or equal to 0.65 mg/l. for two consecutive six-month monitoring periods, they may resume triennial monitoring sooner in accordance with 40 CFR 141.86(d)(iv)(A) or (B) and 40 CFR 141.86(d)(4)(v).

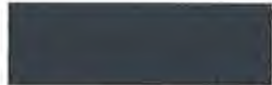
### Conclusion

EPA Regions, primacy agencies and public water systems should work together to ensure robust implementation of the current LCR. OGWDW will continue to support the Regions in these efforts, including promoting innovative approaches to identify lead service lines and lead components in drinking water distribution systems. Please share these technical recommendations with your primacy agencies' drinking water program directors. If you have any questions, please contact Anita Thompkins at [thompkins.anita@epa.gov](mailto:thompkins.anita@epa.gov).

**APPENDIX B. OIG PARTICIPANT SURVEY AND RESULTS**

**CITY OF NEW ORLEANS**

ED QUATREVAUX, INSPECTOR GENERAL



Re: Sewerage and Water Board of New Orleans Lead and Copper Rule Water Quality Testing

March 8, 2017

Dear Mr. or Ms. [REDACTED]:

The New Orleans Office of the Inspector General (OIG) serves the citizens of New Orleans by providing increased accountability and oversight of City of New Orleans government and entities that receive funds through the City. Toward that end, the OIG prevents and detects fraud and abuse and promotes efficiency and effectiveness in the programs and operations of the City of New Orleans.

The Sewerage and Water Board of New Orleans (S&WB) tests drinking water in selected homes every three years according to the Environmental Protection Agency's Lead and Copper Rule (LCR). The rule is designed to ensure the amount of lead and copper does not exceed federal limits. As part of its oversight function, the OIG is reviewing how the S&WB selected participants for the testing process and whether selected sites met LCR criteria.

The OIG received records from the S&WB that indicated the water in your home was tested for lead and copper. We ask that you assist the OIG in accomplishing its oversight mission by taking the enclosed brief survey to tell us about your experience.

*Note: This survey is one element in the OIG review of S&WB's compliance with federal and state water quality testing regulations; nothing in this survey is intended to suggest that the water in the City of New Orleans, or in your house specifically, is not safe to drink.*

If you have any questions or concerns, please call Patrice Rose at (504) 681-3222.

Thank you,

E.R. Quatrevaux  
Inspector General

525 P. CHARTER AVENUE | NEW ORLEANS, LOUISIANA | 70130-3019  
EQUATREVAUX@NOIG.ORG | (504) 681-3200

SEWERAGE AND WATER BOARD LEAD AND COPPER RULE PARTICIPANT SURVEY



2010-2013 Participants

The questions below pertain to the house located at: \_\_\_\_\_

Phone: \_\_\_\_\_

Please note: Phone numbers will be held in strictest confidence. Numbers will only be used if necessary to follow-up on responses.

1. Do you own or rent the house?  
☐ Rent ☐ Other \_\_\_\_\_  
☐ Own ☐ Refuse
2. In approximately what year was the house built?  
☐ Before 1950 ☐ Between 1980 – 1990  
☐ Between 1950 ~ 1980 ☐ After 1990  
☐ I Don't Know
3. How long have you lived in the house?  
☐ Less than 1 year ☐ 3-5 years ☐ 10+ years  
☐ 1-2 years ☐ 6-10 years
4. To the best of your knowledge, have there been any major renovations on the house since January 2014, such as a kitchen or bath renovation?  
☐ Yes  
☐ No  
☐ I Don't Know
5. Does your house currently have (check all that apply):

	Yes	No	I Don't Know
a. A lead service line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Copper pipes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. A reverse osmosis filter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Which of the following best describes the location of your water meter?  
☐ In the grass in front of my house  
☐ Surrounded by cement or other hard surface in the sidewalk, driveway, etc.  
☐ Under tree roots or other garden landscaping  
☐ I Don't Know
7. Since you have been living in this house, have you ever provided the Sewerage and Water Board (S&WB) with a water sample to test for lead and copper?  
☐ Yes; proceed to question 8  
☐ No; skip to question 13  
☐ I Don't Know; skip to question 13
8. If you responded "yes" to question 5, please check all of the following years in which you participated in the testing.

<input type="checkbox"/> 2010	<input type="checkbox"/> 2016
<input type="checkbox"/> 2013	<input type="checkbox"/> I Don't Know
9. How were you invited to participate in the test?  
☐ Letter mailed to residence  
☐ Received kit at community event  
☐ Test kit left outside residence  
☐ Other: \_\_\_\_\_  
☐ I Don't Know

SEWERAGE AND WATER BOARD LEAD AND COPPER RULE PARTICIPANT SURVEY

10. Did the S&WB provide you with your individual lead results?
- ☐ Yes
  - ☐ No
  - ☐ I Don't Know

11. Did the S&WB provide you with educational information about how to reduce the risk of exposure to lead in drinking water?
- ☐ Yes; continue question 13.
  - ☐ No; skip to question 14
  - ☐ I Don't Know; Skip to question 14

12. Please describe the information that you received from S&WB:
- \_\_\_\_\_
- \_\_\_\_\_

13. Have you made any changes since your water was tested, such as (check all that apply):
- ☐ Using a new aerator
  - ☐ Using water filter in kitchen
  - ☐ Running water before using
  - ☐ Changing water service line
  - ☐ Using bottled water
  - ☐ No changes

14. Do you have any concerns about the quality of your water or the water quality testing process that you would like to share with the Office of the Inspector General?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

**2010-2013 Lead and Copper Testing Participants  
Survey Responses**

**Methodology:** A total of 90 surveys were mailed to all residents who participated in the 2010 or 2013 Lead and Copper Rule testing. The following represents the 26 respondents to the survey.

**1. Do you own or rent the house?**

Row Labels	Percent
Own	92.31%
Rent	3.85%
Other	3.85%
Grand Total	100.00%

**2. In approximately what year was the house built?**

Row Labels	Percent
Before 1950	38.46%
Between 1950 -1980	38.46%
Between 1980-1990	15.38%
I don't know	7.69%
Grand Total	100.00%

**3. How long have you lived in the house?**

Row Labels	Percent
6-10 years	11.54%
10+ years	88.46%
Grand Total	100.00%

**4. To the best of your knowledge, have there been any major renovations on the house since January 2014, such as a kitchen or bath renovation?**

Row Labels	Percent
Yes	11.54%
No	88.46%
Grand Total	100.00%

5. Does your house currently have (check all that apply):

Row Labels	Lead	Copper	Reverse Osmosis Filter
Yes	11.54%	46.15%	3.85%
No	26.92%	15.38%	34.62%
I don't know	50.00%	34.62%	42.31%
(blank)	11.54%	3.85%	19.23%
Grand Total	100.00%	100.00%	100.00%

6. Which of the following best describes the location of your water meter?

Row Labels	Percent
In the grass	73.08%
Surrounded by Cement	15.38%
I don't know	3.85%
(blank)	7.69%
Grand Total	100.00%

7. Since you have been living in this house, have you ever provided the Sewerage and Water Board (S&WB) with a water sample to test for lead and copper?

Row Labels	Percent
Yes	96.15%
I don't know	3.85%
Grand Total	100.00%

8. If you responded "yes" to question 5, please check all of the following years in which you participated in the testing.

Row Labels	Percent
2010	3.85%
2016	3.85%
2010, 2013	15.38%
2010, 2016	3.85%
2013, 2016	3.85%
2010, 2013, 2016	34.62%
2010, 2013, 2016, I don't know	3.85%
I don't know	19.23%
(blank)	11.54%
Grand Total	100.00%

**9. How were you invited to participate in the test?**

Row Labels	Percent
Letter to residence	34.62%
Test kit left outside residence	84.62%
Received kit at Community event	3.85%
Other	0.00%
Multiple responses selected*	

**10. Did the S&WB provide you with your individual lead results?**

Row Labels	Percent
Yes	76.92%
No	7.69%
I don't know	11.54%
(blank)	3.85%
Grand Total	100.00%

**11. Did the S&WB provide you with educational information about how to reduce the risk of exposure to lead in drinking water?**

Row Labels	Percent
Yes	30.77%
No	26.92%
I don't know	38.46%
(blank)	3.85%
Grand Total	100.00%

**13. Did you made any changes since your water was tested, such as (check all that apply):**

Row Labels	Percent
Using a new aerator	0.00
Running water before using	15.38
Using bottled water	19.23
Using water filter in kitchen	7.69
Change water service line	3.85
No Change	30.77
(blank)	38.46
Multiple responses selected *	

\*Participants selected multiple responses.

2016 Participants

The questions below pertain to the house located at: \_\_\_\_\_ Phone: \_\_\_\_\_

1. Do you own or rent the house?

☐ Rent ☐ Other \_\_\_\_\_

☐ Own ☐ Refuse
2. In approximately what year was the house built?

☐ Before 1950 ☐ Between 1980 – 1990

☐ Between 1950 – 1980 ☐ After 1990

☐ I Don't Know
3. How long have you lived in the house?

☐ Less than 1 year ☐ 3-5 years ☐ 10+ years

☐ 1-2 years ☐ 6-10 years
4. To the best of your knowledge, have there been any major renovations on the house since January 2014, such as a kitchen or bath renovation?

☐ Yes

☐ No

☐ I Don't Know
5. Does your house currently have (check all that apply):

	Yes	No	I Don't Know
a. A lead service line	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Copper pipes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. A reverse osmosis filter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Which of the following best describes the location of your water meter?

☐ In the grass in front of my house

☐ Surrounded by cement or other hard surface in the sidewalk, driveway, etc.

☐ Under tree roots or other garden landscaping

☐ I Don't Know
7. Since you have been living in this house, have you ever provided the Sewerage and Water Board (S&WB) with a water sample to test for lead and copper?

☐ Yes; proceed to question 8

☐ No; skip to question 15

☐ I Don't Know; skip to question 15
8. If you responded "yes" to question 5, please check all of the following years in which you participated in the testing.

☐ 2010 ☐ 2016

☐ 2013 ☐ I Don't Know
9. How were you invited to participate in the 2016 test?

☐ Letter mailed to residence

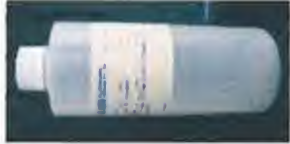
☐ Received kit at community event

☐ Test kit left outside residence

☐ Other: \_\_\_\_\_

☐ I Don't Know

10. Which of the following water bottles most closely resembles the test kit provided to you by S&WB in 2016?



11. Did the S&WB provide you with your individual lead results?

- ☐ Yes  
☐ No  
☐ I Don't Know

12. Did the S&WB provide you with educational information about how to reduce the risk of exposure to lead in drinking water?

- ☐ Yes; **continue question 13.**  
☐ No; **skip to question 14**  
☐ I Don't Know; **Skip to question 14**

13. Please describe the information that you received from S&WB:

\_\_\_\_\_

\_\_\_\_\_

14. Did you make any changes since your water was tested, such as (check all that apply):

- ☐ Using a new aerator      ☐ Using water filter in kitchen  
☐ Running water before using      ☐ Changing water service line  
☐ Using bottled water      ☐ No changes

15. Do you have any concerns about the quality of your water or the water quality testing process that you would like to share with the Office of the Inspector General?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2016 Lead and Copper Testing Participants  
Survey Responses**

**Methodology:** Surveys were sent to 107 residents who participated in the 2016 Lead and Copper Rule testing. The following represents the 52 respondents to the survey.

**1. Do you own or rent the house?**

Row Labels	Percent
Own	88.46%
Rent	11.54%
Grand Total	100.00%

**2. In approximately what year was the house built?**

Row Labels	Percent
Before 1950	36.54%
Between 1950 -1980	23.08%
Between 1980-1990	7.69%
After 1990	5.77%
I don't know	23.08%
(blank)	3.85%
Grand Total	100.00%

**3. How long have you lived in the house?**

Row Labels	Percent
1-2 years	7.69%
3-5 years	9.62%
6-10 years	15.38%
10+ years	63.46%
Less than 1 year	3.85%
Grand Total	100.00%

**4. To the best of your knowledge, have there been any major renovations on the house since January 2014, such as a kitchen or bath renovation?**

Row Labels	Percent
Yes	13.46%
No	80.77%
I don't know	3.85%
(blank)	1.92%
Grand Total	100.00%

<b>5. Does your house currently have (check all that apply):</b>			
Row Labels	Lead	Copper	Reverse Osmosis Filter
Yes	5.77%	23.08%	38.46%
No	19.23%	25.00%	51.92%
I don't know	69.23%	50.00%	3.85%
(blank)	5.77%	1.92%	5.77%
<b>Grand Total</b>	<b>100.00%</b>	<b>100.00%</b>	<b>100.00%</b>

<b>6. Which of the following best describes the location of your water meter?</b>	
Row Labels	Percent
In the grass	86.54%
Surrounded by Cement	3.85%
Under Tree roots	1.92%
I don't know	3.85%
(blank)	3.85%
<b>Grand Total</b>	<b>100.00%</b>

<b>7. Since you have been living in this house, have you ever provided the Sewerage and Water Board (S&amp;WB) with a water sample to test for lead and copper?</b>	
Row Labels	Percent
Yes	86.54%
No	7.69%
I don't know	1.92%
(blank)	3.85%
<b>Grand Total</b>	<b>100.00%</b>

<b>8. If you responded "yes" to question 5, please check all of the following years in which you participated in the testing.</b>	
Row Labels	Percent
2013	1.92%
2016	65.38%
2010, 2016	1.92%
2013, 2016	7.69%
2010, 2013, 2016	11.54%
(blank)	11.54%
<b>Grand Total</b>	<b>100.00%</b>

9. How were you invited to participate in the 2016 test?

Row Labels	Percent
Letter to residence	17.31%
Test kit left outside residence	57.69%
Received kit at Community event	3.85%
Other	11.54%
I don't know	3.85%
(blank)	7.69%
Multiple responses selected*	

10. Which of the following water bottles most closely resembles the test kit provided to you by S&WB in 2016?

Row Labels	Percent
A	69.23%
B	17.31%
(blank)	13.46%
Grand Total	100.00%

11. Did the S&WB provide you with your individual lead results?

Row Labels	Percent
Yes	73.08%
No	5.77%
I don't know	11.54%
(blank)	9.62%
Grand Total	100.00%

12. Did the S&WB provide you with educational information about how to reduce the risk of exposure to lead in drinking water?

Row Labels	Percent
Yes	30.77%
No	26.92%
I don't know	32.69%
(blank)	9.62%
Grand Total	100.00%

14. Did you made any changes since your water was tested, such as (check all that apply):

Row Labels	Percent
Using a new aerator	0.00%
Running water before using	19.23%
Using bottled water	17.31%
Using water filter in kitchen	5.77%
Change water service line	3.85%
No Change	61.54%
(blank)	7.69%
Multiple responses selected*	

\*Participants selected multiple responses.

## APPENDIX C. EPA RECOMMENDED TAP SAMPLING PROCEDURES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

FEB 29 2016

WSG 197  
Date Signed: February 29, 2016

OFFICE OF  
WATER

### MEMORANDUM

SUBJECT: Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule

FROM: Peter C. Grevatt, Director  
Office of Ground Water & Drinking Water 

TO: Water Division Directors  
Regions 1 - X

The Lead and Copper Rule, 40 C.F.R. Sections 141.80 to 141.91, requires monitoring at consumer taps to identify levels of lead in drinking water that may result from corrosion of lead-bearing components in a public water system's distribution system or in household plumbing. These samples help assess the need for, or the effectiveness of, corrosion control treatment. The purpose of this memorandum is to provide recommendations on how public water systems should address the removal and cleaning of aerators, pre-stagnation flushing, and bottle configuration for the purpose of Lead and Copper Rule sampling.

### Removal and Cleaning of Aerators

EPA issued a memorandum on *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule* on October 20, 2006. This memorandum stated that EPA recommends that homeowners regularly clean their aerators to remove particulate matter as a general practice, but states that public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples gathered for purposes of the Lead and Copper Rule. EPA continues to recommend this approach. The removal or cleaning of aerators during collection of tap samples could mask the added contribution of lead at the tap, which may potentially lead to the public water system not taking additional actions needed to reduce exposure to lead in drinking water. EPA's recommendation about the removal and cleaning of aerators during sample collection applies only to monitoring for lead and copper conducted pursuant to 40 C.F.R. 141.86.

### Pre-Stagnation Flushing

EPA is aware that some sampling instructions provided to residents include recommendations to flush the tap for a specified period of time prior to starting the minimum 6-hour stagnation time required for samples collected under the Lead and Copper Rule. This practice is called pre-stagnation flushing. Pre-stagnation flushing may potentially lower the lead levels as compared to when it is not practiced.

Flushing removes water that may have been in contact with the lead service line for extended periods, which is when lead typically leaches into drinking water. Therefore, EPA recommends that sampling instructions not contain a pre-stagnation flushing step.

#### Bottle Configuration

EPA recommends that wide-mouth bottles be used to collect Lead and Copper compliance samples. It has become apparent that wide-mouth bottles offer advantages over narrow-necked bottles because wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water. In addition, a higher flow rate can result in greater release of particulate and colloidal lead and therefore is more conservative in terms of identifying lead concentrations.

#### Conclusion

EPA is providing these recommendations for collection of Lead and Copper Rule tap samples to better reflect the state of knowledge about the fate and transport of lead in distribution systems. The three areas discussed above may potentially lead to samples that erroneously reflect lower levels of lead concentrations. The recommendations in this memorandum are also consistent with the recommendations provided by the EPA's Flint Task Force. For more information about the Task Force please view EPA's website at: <http://www.epa.gov/flint>.

To provide further information on this topic, EPA included an amended "Suggested Directions for Homeowner Tap Sample Collection Procedures" in Appendix D of the 2010 revision of *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (EPA 816-R-10-004). This document can be found at:

<http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.txt>

Please share these recommendations with your state drinking water program directors. If you have any questions, please contact Anita Thompkins at [thompkins.anita@epa.gov](mailto:thompkins.anita@epa.gov).

#### Attachment

cc: James Taft, Association of State Drinking Water Administrators

**Suggested Directions for Homeowner Tap Sample Collection Procedures**  
***Revised Version: February 2016***

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your State under the Lead and Copper Rule, and is being accomplished through a collaboration between the public water system and their consumers (e.g. residents).

Collect samples from a tap that has not been used for at least 6 hours. To ensure the water has not been used for at least 6 hours, the best time to collect samples is either early in the morning or in the evening upon returning from work. Be sure to use a kitchen or bathroom cold water tap that has been used for drinking water consumption in the past few weeks. The collection procedure is described below.

1. Prior arrangements will be made with you, the customer, to coordinate the sample collection. Dates will be set for sample kit delivery and pick-up by water system staff.
2. There must be a minimum of 6 hours during which there is no water used from the tap where the sample will be collected and any taps adjacent or close to that tap. Either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist. Do not intentionally flush the water line before the start of the 6 hour period.
3. Use a kitchen or bathroom cold-water faucet for sampling. If you have water softeners on your kitchen taps, collect your sample from the bathroom tap that is not attached to a water softener, or a point of use filter, if possible. Do not remove the aerator prior to sampling. Place the opened sample bottle below the faucet and open the cold water tap as you would do to fill a glass of water. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. If any plumbing repairs or replacement has been done in the home since the previous sampling event, note this information on the label as provided. Also if your sample was collected from a tap with a water softener, note this as well.
6. Place the sample kit in the same location the kit was delivered to so that water system staff may pick up the sample kit.
7. Results from this monitoring effort and information about lead will be provided to you as soon as practical but no later than 30 days after the system learns of the tap monitoring results. However, if excessive lead and/or copper levels are found, immediate notification will be provided (usually 1-2 working days after the system learns of the tap monitoring results).

Call \_\_\_\_\_ at \_\_\_\_\_ if you have any questions regarding these instructions.

<b>TO BE COMPLETED BY RESIDENT</b>	
Water was last used: Time _____	Date _____
Sample was collected: Time _____	Date _____
Sample Location & faucet (e.g. Bathroom sink): _____	
I have read the above directions and have taken a tap sample in accordance with these directions.	
Signature _____	Date _____